UNION ZUR FÖRDERUNG VON OEL- UND PROTEINPFLANZEN E.V.

# Biodiesel 2017/2018

## Report on Progress and Future Prospects – Excerpt from the UFOP Annual Report

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# Biodiesel 2017/2018

## Assessment report and outlook – Excerpt from the UFOP annual report

# List of tables and graphics in the report

## Tables



## Graphics

# Table of contents

# Biodiesel & Co.

## Excerpt from the Annual report 2017/2018

## International and national climate protection policy

With the Paris climate agreement, the signatory states agreed in November 2015 not only to the internationally binding target of limiting the rise of global warming by 2050 to a maximum of 2 degrees, but also to the schedule for coordinating the methods for calculating the reduction of greenhouse gas (GHG) emissions. This is expected to be concluded at the next World Climate Change Conference (COP23) in November 2018 in Katowice, Poland. The preparatory UN Climate Change Conference for coordinating the necessary rules for this took place in Bonn in April 2018. These rulings will determine the future national and European climate protection policy, as will the scope of regulations of the "Winter package", which the EU Commission presented in November 2016 (see also UFOP report "Biodiesel 2016/2017, Pg. 7 ff.). The primary interim target is to reduce GHG emissions in the EU by 40 % by 2030 compared to the base year 1990.

With the decision of the federal government in November 2016, Germany was the first member state to incorporate the framework for action in the "Climate protection plan 2050", which includes the national climate protection target broken down into economic sectors for the period between 2021 and 2030. The climate protection law announced for this in the coalition contract of the new German federal government is now gathering pace. The German Federal Environment Minister, Svenja Schulze, announced that the sector-specific targets were to be bindingly incorporated in this law. Environmental associations and in particular the WWF had strongly urged for this. The departments responsible for the sectors economy, energy, transport, construction/living as well as agriculture and forestry must submit proposals for action to the leading German Federal Environment Ministry (BMU - Bundesumweltministerium) by the end of 2018. The measures must not only be convertible for the period 2021 to 2030, but must also serve to meet the target. This will not only be the quality standard for the BMU, but also for the public and in particular here the environmental associations. The public dialogue held on this by the BMU with the trade associations of economy, for nature conservation and environmental protection, the trade unions, federal ministries, federal states and municipal associations as part of the "Climate Protection Action Group" ensures effective pressure for incorporating ambitious climate protection measures sector-specifically with scrutiny. UFOP participates in these meetings as a member of the so-called "Bank of Agriculture and Forestry". The BMU had chosen this "Viennese Format" so that the sectors are forced to vote on speakers and positions. Every sector must verify its specific target fulfilment, i.e. this will be specifically calculated from 2021. The effectiveness of the measures is tangible reality in the sense of equally tangible payments if the sectoral GHG reduction target is not fulfilled. Since agriculture, like the transport and building sector, is one of the non-emissions-trading sectors (non-ETS), the German federal government must make up the difference between tax funds by acquiring pollution rights ($CO_2$ certificates) when the target is not met. The Finance Minister is therefore always involved when discussing the fulfilment of targets. It must be noted that the prices for $CO_2$ certificates have gone up 300 % to around 14 EUR/t $CO_2$ in twelve months. The restriction of emissions-trading certificates resolved and implemented by the Environment Council is taking effect which will cause future demand to rise. That is a certainty if, from 2021 onwards, the demand particularly rises from the non-ETS sectors. In addition to agriculture, the building and transport sectors are affected in particular, measured in terms of their GHG load and the problems in implementing measures (building renovation, reduction in fuel consumption). GHG emissions thus rose further in the transport sector than any other to more than 170 million. t $CO_2$ in 2017 (2014: 160 million t). From a global perspective, transport also remains the key challenge in climate protection. Experts from the International Energy Agency (IEA) expect the global passenger car fleet to double to two billion vehicles by 2040.

## National annual targets for reducing GHG emissions

The definition of binding national annual targets for reducing GHG emissions in the period between 2021 and 2030 is regulated by the conforming regulation (2018/842/EC), which came into effect in May 2018. For Germany there is now a general reduction target of 38 % compared to 2005. In the area of non-emissions-trading sectors, the member states have to reduce GHG emissions linearly by 30 % by 2030. For the agriculture and forestry sector, the GHG reduction target is approx. 14 million t $CO_2$ equivalent. The regulation includes a range of measures on flexibilisation for meeting the target. Member states, for example, will be authorised to withdraw or transfer emission allocations. On the whole the regulations are very complicated and not very transparent. This is one of the key problems and causes for the low public acceptance and/or lack of interest in the regulatory measures. The provisions will make an impact in the public eye and/or will be tangible once the targets are to be enforced with regulatory measures (climate protection through building renovation, $CO_2$ targets for passenger vehicles and light commercial vehicles etc.). Federal Environment Minister, Svenja Schulze, had to admit how difficult it is to meet national targets as she informed the public that the commitment target of a 40 % GHG reduction in 2020 will not be met, but will have fallen considerably short at 32.5 %. This step was overdue in light of the target divergence being confirmed by various institutes. The alarming thing is that Germany set itself this target back in 2007. So 13 years have not been sufficient for meeting this target. Germany has given up its leading role in the EU. Trade associations have been demanding realistic reduction targets for a long time now.

It still remains a general target to limit the already visible consequences of climate change. It is therefore the burden and the particular responsibility of developed countries to speed up this transformation process with ambitious measures and innovative technologies.

A key challenge is the associated increase in global transport, particularly in emerging markets, resulting from a rise in population to more than nine billion people in 2050. Climate scientists are sounding the alarm and are calling for a transport revolution. The mobility-induced $CO_2$ output per inhabitant in the OECD states according to the International Transport

Forum (ITF) is 3 t. In light of this, the signatory states of the Paris climate agreement pledged to present binding national climate protection action plans in 2020 at the latest. Germany presented the national climate protection plan 2050 at the Climate Change Conference in Marrakesh (COP22) in November 2016.

## The future of the combustion engine

In light of these challenges, the question is raised as to the organisation of the transformation process, i.e. the change-over to efficient and affordable GHG-neutral alternative fuels and power trains. Politics and economy are under intensive trading and innovation pressure. Transition processes which also affect the demand behaviour of consumers are time-consuming and must therefore be organised in a way that is open to technology with regard to the various challenges. The predefined timescale up to 2030 or up to 2050 makes it clear that the decarbonisation of global transport – i.e. the transition towards a lower carbon turnover – requires further development of existing as well as the testing and use of innovative technologies, and also investments in new structures for the production of gaseous or liquid fuels from renewable electricity (power-to-X fuels). The members of the UFOP Expert Commission "Biofuels and renewable resources" examined this problem in great detail during their annual meeting. The Managing Director of the Association of the German Petroleum Industry (MWV - Mineralölwirtschaftsverband), Prof. Dr. Christian Küchen, presented the development prospects and the need for action. With the target of gradual decarbonisation through hydration with hydrogen made from renewable electricity, an adaptation of the raw materials and their origin as well as through the admixture of biofuels ("Vision 2050"), existing refinery locations must be adapted to the modified challenges. Sustainable biofuels must make their contribution in the short to medium term, according to UFOP. Naturally, UFOP is highly interested in the fact that the combustion engine will continue to remain an important power train unit in future. The vehicle industry is just as interested. The ban on the combustion engine called for by environmental associations in light of the diesel scandal is unrealistic if the climate protection targets in transport are to be met. To implement new infrastructures like overhead lines on motorways in this short period by investing billions is utopian. In addition, transport must remain affordable. The mobility must focus on the customers and areas of application, where in particular the infrastructure development (charging stations) can be implemented promptly and an emission-free power train yields the greatest environmental benefit, i.e. in cities. But here, too, the economy seems to inhibit itself in light of the problems with the charging stations (functionality, accounting systems, standardisation of connectors etc.). The number of permissible passenger cars with a fully or partially electric power train (plug-in hybrid) speaks for itself. The Federal Motor Transport Authority (KBA - Kraftfahrtbundesamt) accounts for 3.44 million newly approved passenger cars for the calendar year 2017, among them approx. 25,000 purely electrically driven vehicles and around 85,000 passenger cars with a hybrid power train, of which approx. 30,000 are plug-in hybrids. However, the percentage of diesel-driven passenger cars among the new approvals reduced by nearly 39 %. This shows the uncertainty of customers as a result of the diesel scandal and the associated debates on driving bans. When structuring the transformation process for the future supply of the transport sector with renewable energies, the global changing needs have to be taken into account in addition to the German and European market. According to the International Energy Agency (IEA), the number of passenger cars will have practically doubled to around two billion by 2040. Globally, the combustion engine is and will remain the most important power train in this process. The "transport revolution" is as such an international challenge, which also opens up possibilities of developing the German economy in the field of process and plant technology. The binding willingness to take this on must therefore be reflected in the national energy and climate plans, which must be submitted by the EU member states of the EU Commission by 2019 and the signatory states of the Paris climate agreement by 2020. From a historical perspective, biodiesel and above all bioethanol (see Brazil and USA) have verified the "potential for integration" into existing processing and distribution structures. As measured by the above-mentioned territorial states, electrification over very long distances is simply not feasible. The combustion engine

must and will therefore maintain its perspective whilst fuel efficiency and exhaust gas quality improve at the same time. In this environment, the fuel mix will become more diverse as a result of various production processes and raw material origins. This way, the question of potential interactions between different fuel components will be a central research task in order to rule out potential engine-related problems, including those brought about by ageing effects. During the conference "Fuels of the Future 2018 – International Conference on Renewable Mobility" organised by UFOP, among others, the question of the future of the combustion engine was one of the central transport issues. In particular the composition of diesel fuels with different biodiesel proportions or biocomponents and non-polar paraffinic proportions (HVO, GTL ...) is developing into one of the greatest challenges for the petroleum and vehicle industry from a global point of view. Due to ever-increasing requirements under emissions law, the engine development and the ever more complex systems for exhaust aftertreatment are the main focus. But the development pressure is not only rising from a legal point of view; the customers are also demanding consumption-reduced engines to the extent possible.

## National climate protection plan 2050

With the national climate protection plan 2050, Germany has stipulated the GHG reduction target for the transport sector by 2030. With the stipulated $CO_2$ limit values for new vehicles (passenger cars: 95 g $CO_2$/ km; light commercial vehicles: 147 g $CO_2$/km) at EU level from 2021, together with further dated reductions in 2025 and 2030, the introduction into electrification through hybridisation and purely electric power train is essential. The definition of $CO_2$ limit values, also for heavy commercial vehicles, including off-road (construction vehicles, agricultural vehicles), will also be discussed. Their non-fulfilment leads to significant penalty fees running into billions. The penalties are to be paid to the EU Commission. Not least this threat of force drives the development of innovations in an economic sector which is important for the German national economy forward.

The market introduction of innovative power trains begins with the new approval, primarily in developed countries which have the corresponding per-capita income. However, used vehicles are traded globally and will therefore determine the power train technology and thus its efficiency for decades to come. Consequently, from UFOP's view, the global process for the decarbonisation of transport is beginning at the same time as e-mobility is developing with market-introduced biofuels and gradually with synthetic fuels. Instead of a debate which is unfortunately often very controversial with the aim of accomplishing e-mobility in the truest sense, an integrated strategy that focuses on the interlinking of sectors in conjunction with a promotion that is open to technology and raw materials should be developed for achieving the climate protection targets. This process will be driven forward regionally by the availability of resources and national statutory admixture specifications. These are not only very different in the European Union as a result of the national implementation of guidelines (see Pg. 39–41). Particularly for leading agricultural export nations like the USA, Brazil, Argentina, Indonesia and Malaysia, global trading with biofuels and their raw materials is of particular importance for the added value in the agricultural sector. At the same time, the flexible adaptation of admixture quotas (see Tab. 1) in the domestic fuel market is an important instrument for quantity and supply control. However, the causes are very different. Through the expansion of soybean cultivation as the result of an increasing demand for meat, an alternative outlet for soybean oil (Argentina, Brazil, USA) must be created. In the case of palm oil, it is increasingly plantation areas made through approved and above all non-approved deforestation (see Pg. 10), that are causing additional supply pressure, in addition to the ever-growing yield level of oil palms (currently approx. 3.5 t/ha). At the end of July 2018, the Indonesian Minister-President commissioned the Ministry of Industry to verify whether the production and thus the use of diesel fuel are possible with a share of 30 % biodiesel (B30). This was justified by palm oil sales being too low as part of a B20 mandate. With the change to B30, the government expects additional domestic sales of 0.5 million t of palm oil. However, even in the above-mentioned countries, the surpluses for soya or maize are providing for an adaptation of the national admixture quotas or corresponding activities for verifying whether B20 (see Brazil) can be used, for example. In the USA, E15 was practically introduced by force. These national statutory regulations also cement the prospect of the combustion engine and thus the need for action for systematic accompanying research to ensure smooth operation even with higher amounts of biofuels. The executed projects and achieved results in this overall context, among others with the support of UFOP, the German Agency for Renewable Resources (FNR - Fachagentur für Nachwachsende Rohstoffe) as well as the German Research Association for Combustion Engines (FVV - Forschungsvereinigung Verbrennungskraftmaschinen e.V.), therefore require greater international attention. Biofuel research is therefore also a key component of expert forums during the International Conference "Fuels of the Future".

### Tab. 1: Biodiesel – admixture mandates higher outside of EU

| Biofuel mandates % | 2018 | 2019 |
|---|---|---|
| Indonesia | 20 | 20 (30 being assessed) |
| Malaysia | 7 | 10 |
| Argentina | 8 | 12 |
| Brazil | 8 | 10 |
| Thailand | 7 | 10 |
| USA RFS programme | 5.8 million t | 6.3 million t (2017: 6.7 million t ) |

* Source: F.O. Licht, Biofuel Digest, FAS, Platts

## Reform of the Renewable Energies Directive (RED II)

For biofuels, the principle must continue to apply that exclusively GHG-optimised and certified sustainable biomass raw materials or biofuels are used. These requirements were first introduced with the Renewable Energies Directive (2009/28/EC) in 2009. In the revised version of the Renewable Energies Directive (RED II), a tightening of the sustainability and evidence requirements, which also have to be implemented in third countries as a prerequisite for market access into the EU, was coordinated. This focused on regulations for limiting (putting caps on) biofuels made from cultivated biomass and above all here on regulations for the topic of "palm oil" geared towards the media by environmental associations vis-à-vis policymakers and the general public. In the reporting period, a rather controversial debate, in which UFOP also publicly (see Chap. 3.1) participated in cooperation with the Committee of Professional Agricultural Organisations-General Confederation of Agricultural Cooperatives (COPA-COGECA) and the European Oilseed Alliance (EOA), took place during the coordination process in the European Parliament and in the Council.

## Results of the trilogue negotiations

Since the proposal of the EU Commission of November 2016 (EU winter package) covered eight legislative proposals with well over 1,000 pages in total, the package was divided into two sub-packages for the consultations in the trilogue procedure.

Up to 30.06.2018: Bulgarian Council Presidency – Package 1:

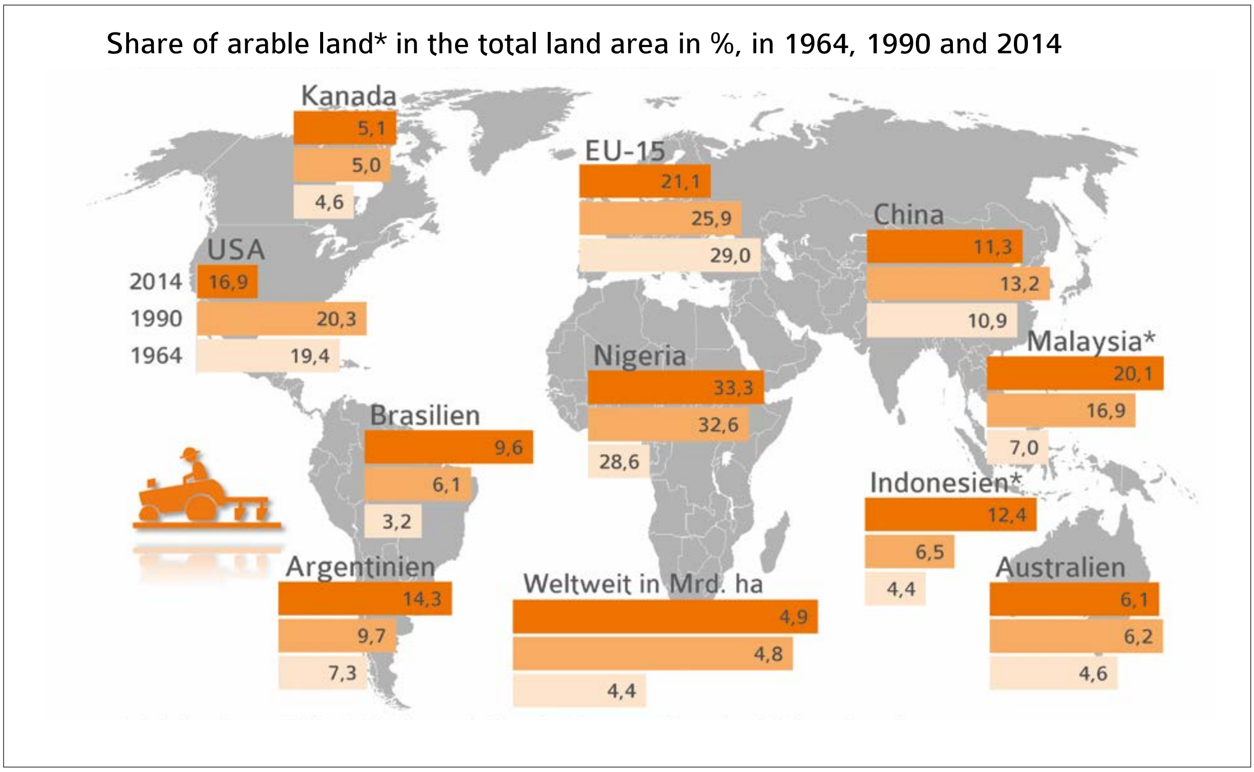
- Revised version of the Renewable Energies Directive
- Governance regulation
- Energy efficiency directive

From 01.07.2018: Austrian Council Presidency– Package 2:

- Electricity market regulation
- Internal electricity market directive
- Regulation on risk prevention
- Building efficiency directive
- Regulation on the role of the EU Agency for the Cooperation of Energy Regulators.

At the end of June 2018, the permanent representatives of the member states in the EU Commission had backed the result of the trilogue decision of 14th/15th June 2018. The member states thus cleared the way for formally addressing the trilogue decision to the European Parliament, which will presumably vote on this in October 2018. Should the EU parliament agree, the RED II shall enter into force 20 days after publication in the Official Journal of the European Union. Then the period for national implementation begins. Agreement was reached on the energy efficiency directive on 19th June 2018 in the trilogue procedure. The core of the decision is a target of a 32 % share of renewable energies by 2030 (review by the EU Commission in 2023), which is binding for the European Union. This regulation enables the EU Commission to increase pressure on a member state to meet the target using proposals for action if the member state is noticeably not acting with sufficient ambition to do so.

### Fig. 1: Growth of arable land and palm oil plantations in the southern hemisphere




* in Indonesia and Malaysia land development of plantations; EU-15 without Belgium and Luxembourg
Source: UFOP Supply Report 2017/2018, AMI

## Tab. 2: Overview of most important regulatory subjects of the RED II:

Share of renewable energies in the primary and/or overall energy consumption: 32 % – EU Commission will evaluate the target in 2023

| |
|---|
| **Transport sector** |
| Share of renewable energies in transport: 14 % – EU Commission will evaluate in 2023; |
| Retaining the cap of 7 % (energetic) for biofuels made from cultivated biomass (1G) measured in terms of energy consumption in road and rail transport; |
| Limit of 1G measured in terms of consumption in 2020 plus 1 % if 7 % is not exceeded; |
| If the 1G consumption in a member state remains below 1 %, the share can be increased to max. 2 % |
| **Palm oil** |
| Limitation of the quantity share from 2021, basic: Consumption rate in 2019, target: gradual reduction of the palm oil share from 2023 to 0 % by 31.12.2030 at the latest; regulation: delegated legislative act |
| Template: Reports of the EU Commission to EU Council and EU Parliament by 01.02.2019:<br>1. on the current production expansion (plantations/deforestation) globally to the relevant food and animal feed crops, EU Commission determines the criteria for the certification for differentiating biomass raw materials (for biofuels and bioliquids and solid biomass) with a high and low "iLUC risk", regulation: delegated legislative act;<br>2. by 01.09.2023, the EU Commission shall revise the criteria on the basis of the best available scientific data and, if necessary, shall make an adaptation which allows for gradual reduction of biofuels, bioliquids and (solid) biomass made from cultivated biomass with a high iLUC risk of areas with a high carbon content, regulation: delegated legislative act |
| **Cap of biofuels made from cultivated biomass** |
| Authorisations of the member states:<br>1. Reduction of the target 14 % in transport to the same degree as the 1G share is reduced proportionately; a reduction to the share 0 % 1G is possible; when reducing, the member state may differ according to raw material types (low and high iLUC risk);<br>2. Implementation of targets (quotas) on the basis of: energy content, volume or greenhouse gas reductions (GHG quota like Germany) |
| **Counting/targets for advanced biofuels (2G)** |
| Sub-targets for 2G, among other things made from residual materials such as straw, manure and bagasse (from sugar cane) according to positive list for residual and waste materials Annex IX, Part A: beginning with 0.2 % in 2022, 1.0 % in 2025 and 3.5 % in 2030; |
| Limit for 2G from waste materials (used vegetable oils/fats, animal fats (cat. 1 and 2)) to 1.7 %; member states can define a higher cap upon verification of availability and agreement of the EU Commission |
| **Assignment of multipliers for counting to the transport target** |
| Biofuels based on raw materials from Annex IX (Part A and B): 2x |
| Electromobility in road transport: 4x |
| Renewable electricity in rail transport: 1.5x |
| Renewable fuels in air and sea transport: 1.2x |

Source: EU Commission, 2016/0382 (COD) / Status: 21.06.2018

The member states thereby have clarity on the framework conditions at EU level for drawing up the so-called "integrated national climate and energy plans" for the period 2021 to 2030, which must be submitted to the EU Commission at the latest at the end of 2019 (originally 01.01.2019). The trilogue procedure for package 1 was not least for this reason concluded promptly. A prompt coordination between the negotiating partners is thus also expected for package 2.

UFOP criticised the trilogue result with the statement that climate protection and European agriculture are the losers. Measured in terms of available and sustainably certified biomass potential, the very option for GHG reduction will be inhibited which is currently and provisionally the only GHG-reducing alternative available. The German Federal Office for Agriculture and Food (BLE - Bundesanstalt für Landwirtschaft und Ernährung), in its evaluation report for 2016, comes to the conclusion that biofuels have reduced the $CO_2$ emissions in the transport sector by 7.3 million t $CO_2$ equivalents. These are primarily biofuels from European cultivation and processing. This applies to practically all member states. For the share of biofuels made from palm oil, there are no reliable official statistics available. The data of the private market observation companies fluctuates between 2 and 3 million t. This also applies to the share of biofuels made from waste oils and fats. Business circles refer to 4 million. t in 2017 with an overall consumption of approx. 13.2 million t (approx.10 .8 million t biodiesel and approx. 2.4 million. t HVO). Whilst biodiesel consumption has stagnated since 2010, the sales of HVO have multiplied more than ten times from 0.22 million t to 2.4 million t (see Tab. 3). UFOP assumes, particularly in the production of HVO, that large quantities of palm oil have been used. The announcement made by the petroleum company Total in France at the refinery location La Mède in 2018 that it would commission a HVO plant with a capacity of 0.5 million t and primarily operate it with palm oil, led to nationwide protests in front of refineries and at petrol stations which the French National Federation of Agricultural Holders' Union (FNSEA - Fédération nationale des syndicats d'exploitants agricoles) had initiated. These actions underline once more how heavily the outlook of European rapeseed cultivation relies on the future development of biodiesel consumption and thus on the European biofuel policy. The volume and price pressure drove French farmers onto the street.

UFOP welcomed not only the fact that the binding target for the share of renewable energies in the overall final energy

## Tab. 3: Global biodiesel and HVO consumption 2010–2017 (in 1,000 t)

| Biodiesel production | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| EU-27 | 11,631.00 | 11,484.00 | 11,440.00 | 10,596.00 | 11,504.00 | 10,518.00 | 10,490.00 | 10,830.00 |
| Canada | 108.00 | 221.00 | 257.00 | 335.00 | 335.00 | 470.00 | 387.00 | 426.00 |
| USA | 867.90 | 2,923.80 | 2,953.50 | 4,629.90 | 4,629.90 | 4,930.20 | 6,798.00 | 6,448.20 |
| Argentina | 508.60 | 748.70 | 874.80 | 885.00 | 970.10 | 1,013.90 | 1,033.00 | 1,173.30 |
| Brazil | 2,040.60 | 2,259.60 | 2,304.40 | 2,589.90 | 3,001.00 | 3,524.20 | 3,343.60 | 3,374.00 |
| Colombia | 296.00 | 450.00 | 488.20 | 505.70 | 518.70 | 523.40 | 506.00 | 513.30 |
| Peru | 85.70 | 238.80 | 251.00 | 261.20 | 257.20 | 277.80 | 293.60 | 290.40 |
| India | - | - | - | - | - | - | - | 20.00 |
| Indonesia | 196.00 | 315.00 | 589.00 | 922.00 | 1,565.20 | 805.60 | 2,647.00 | 2,517.00 |
| Malaysia | 6.00 | 15.00 | 110.00 | 165.00 | 172.00 | 255.00 | 278.00 | 299.00 |
| Philippines | 110.00 | 108.00 | 121.00 | 135.00 | 143.00 | 150.00 | 192.00 | 200.00 |
| Thailand | 553.60 | 559.40 | 801.90 | 897.80 | 1,074.80 | 1,134.90 | 1,025.30 | 1,254.50 |
| Rest of the world | 796.00 | 803.00 | 941.00 | 1,416.00 | 3,431.00 | 1,460.00 | 1,580.00 | 1,498.00 |
| TOTAL | 17,199.30 | 20,126.30 | 21,131.80 | 23,338.50 | 27,602.00 | 25,063.00 | 28,573.80 | 28,843.60 |

| HVO consumption* | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| EU-27 | 222.00 | 563.00 | 1,442.00 | 1,128.00 | 1,757.00 | 2,115.00 | 2,008.00 | 2,371.00 |
| USA | - | 15.00 | 139.00 | 149.00 | 154.00 | 77.00 | 63.00 | 67.00 |
| Singapore | 32.00 | 186.00 | 293.40 | 1,093.10 | 1,437.00 | 1,514.90 | 1,745.30 | 1,952.40 |
| Thailand | - | - | - | 10.00 | 15.00 | 15.00 | 15.00 | 15.00 |
| Rest of the world | 38.00 | 83.00 | 101.00 | 43.00 | 184.00 | 123.00 | 225.00 | 435.00 |
| TOTAL | 292.00 | 847.00 | 1,975.40 | 2,423.10 | 3,547.90 | 3,844.90 | 4,056.30 | 4,840.40 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sum total biodiesel/ HVO consumption worldwide** | **17,491.30** | **20,973.30** | **23,107.20** | **25,761.60** | **31,149.90** | **28,907.90** | **32,630.10** | **33,684.00** |

* HVO = Hydrogenated Vegetable Oil
Source: F.O. Licht

consumption shall be raised to 32 % (the EU Commission had suggested 27 %), but also the forward projection of the binding target of renewable energies in transport for the member states from 10 % in 2020 to 14 % in 2030.

## Cap and counting factors control the demand

However, the trilogue decision allows for considerable reduction options for biofuels made from cultivated biomass, as can be seen from the overview (see Pg. 11). The recitals of the RED II describe the intention to reduce the share of biofuels made from cultivated biomass. The existing authorisation for the member states to reduce the national cap is being supplemented by the option to also reduce the renewable energies target for the transport sector. At the same time, a horizontal cap is being introduced on the biofuel quantity consumed in 2020 for biofuels made from cultivated biomass. If the maximum share for biofuels made from cultivated biomass of 7 % is not exceeded, it is also possible to raise the cap by one percentage point. With these regulations, the EU Commission will reach its target of limiting the overall sales potential of the market-introduced biofuels made from cultivated biomass to under 4 % in the overall energy consumption in road and rail transport. From the point of view of UFOP, the Directorate-General for Agriculture has not been sufficiently involved in the coordination process within the EU Commission. On the other hand, the DG AGRI would have had to claim responsibility for itself due to the enormous involvement of European Agriculture.

The European biodiesel economy will also be affected by ever-increasing competition after 2021, including the oil mill industry, which is already having to battle with considerable capacity problems today. The German biodiesel economy has so far managed to export the rapeseed oil accumulated from grinding over 9 million t of rapeseed primarily into EU countries (2017: 1.2 million t, for biodiesel production, amongst other things), in the domestic biodiesel market (2016: approx. 0.8 million t RME, source BLE) or sell it as an RME share via the biodiesel export (2017: approx. 1.6 million t). UFOP publishes this information on its homepage under the category "Chart of the week": https://www.ufop.de/english/news/chart-week/.

Particularly affected is the biogas sector, which is aspiring to secure a strong position for entering this business field with the supply of biogas if the EEC support for the first biogas plants expires from 2020. The cultivation of silage maize is covered by the already introduced regulation that the cultivated "main crop" generally falls below the cap for biofuels made from cultivated biomass if this is exclusively cultivated for producing biofuel. From an ecological point of view, it is frustrating that entry as a raw material into the fuel market will then be refused to the hopeful "Silphium perfolatium" as a flowering plant. On the other hand, the corn stover could be used which is produced for the CCM (Corn-Cob-Mix) harvest in pig holdings, for example, and is fermented as a residual material together with the manure.

### Tab. 4: 14 % transport target 2030 – Target attainment

| Biofuel mandates % | physical | Multiplier | calculative |
|---|---|---|---|
| Annex IX Part A[1] | 1.75 % | 2 | 3.5 % |
| Annex IX Part B[1] | 1.70 % | 2 | 3.4 % |
| E-mobility road | 0.90 % | 4 | 3.6 % |
| E-mobility rail | 1.00 % | 1.5 | 1.5 % |
| GAP CONVENT. BIOFUELS | 2.00 % | 1 | 2.0 % |
| TOTAL | 7.35 % | | 14.0 % |

[1] see Fig. 4, Pg. 47
Source: RED II/VDB

With the multiple counting of biofuels made from residual and waste materials, e-mobility and biofuel quantities in air and sea transport, the share of biofuels made from cultivated biomass could be further reduced, as shown in Table 5. In the worst case, this could reduce to just 2.0 % if e-mobility in particular actually experiences an exceptional market launch in this period. However, in view of the development of approvals and the inhibited development of infrastructure in the EU, this is not to be feared.

UFOP criticised the cap of 1.7 % on biofuels made from waste oils and animal fats as being far too high. This is because from these "raw materials", only those biofuels are produced as a diesel substitute (UCOME and HVO) which push RME out of the market as a result because the limit of 1.7 % and thus the maximum possible physical quantity relates to the overall energy consumption in the transport sector, i.e. including the petrol consumption. For the EU-28 (overall fuel consump-

#### Counting factors – UFOP viewpoint

**"With the counting factors, the share of renewable energies is projected virtually to the target 14 %, and indeed without a climate protection effect. In contrast: Due to the electricity mix, which is still carbon-based, the non-attainment of the climate protection target is even still politically supported. Policies clearly disregard the time pressure for meeting the climate protection targets. The measures are not developed from the direction of the dated target fulfilment, but from the existing level. This is anything but ambitious. An effective climate protection in transport will be postponed until the period after 2030; then it may be too late."**

tion approx. 280 million t), this would currently be around 4.7 million t. According to F.O. Licht, approx. 4.0 million t were sold in the EU in 2017. Let us hope that Great Britain will continue to pursue the national biofuel policy for raising waste-derived biofuel quantities after Brexit. Another reason is the fact that these raw materials, too, are limited in their availability and the legally rooted competitive disadvantage through multiple counting has led to extensive imports of these raw materials and/or biofuels produced from these into the European Union. The EU Commission is therefore rightly increasing pressure on the member states with the extended regulations of the RED II for intensifying burdens of proof in order to prevent any intentions to defraud. A further increasing use of waste oils and fats is to be viewed sceptically if these raw materials have to be withdrawn from existing usage lines due to multiple counting and replaced with raw materials made from cultivated biomass. The RED II confirms compliance with the Waste Framework Directive, which also applies in third countries with intended use for "motor biofuels and heating biofuels". The certification bodies must then check even more carefully whether waste oils etc. in Asia have been "produced" for export and/or whether their intended use has been changed. The EU environment policy thereby underlines the priority of cascading use as part of a recycling economy that is to be improved. The experts of the certification bodies are the extended arm of the EU for enforcing the sustainability requirements legally enshrined in the RED II for waste oils and fats, as they are for monitoring sustainable biomass production. This regulation is thus a strategically important option in the area of the overall biofuel supply chain for creating fairer competition ("level-playing-field"). The RED II includes measures with an assertiveness that has not yet been used by policies to date. Because these apply only to the intended use "energetic use". The environmental associations in particular are missing out on an option here.

The minimum market shares for biofuels made from residual materials (see Pg. 15) specified in the RED II for the companies of the petroleum industry are overambitious from the point of view of UFOP and will lead to financial penalties that the companies will reclaim from the customer at the fuel pump. The gradual rise of these minimum obligations to 3.5 % in 2030 is to be analysed with respect to its feasibility. This is because the absolute quantity (approx. 4.9 million t) also originates from the overall energy consumption in transport here, i.e. including (!) current diesel sales of approx. 280 million t across the EU. With the known and financially implementable procedures, if any, bioethanol is produced from residual materials such as straw. This quantity must then be sold in the much smaller petrol market (approx. 80 million t). It must

## Tab. 5: Preliminary estimated emissions resulting from indirect land use changes through bioliquids (in g $CO_{2eq}$/MJ)

| Raw material group | Mean value* | Range between the percentiles derived from the sensitivity analysis** |
|---|---|---|
| Grain and other crop plants with starch content | 12 | 8 to 16 |
| Sugar plants | 13 | 4 to 17 |
| Oil plants | 55 | 33 to 66 |

* Source: EU Commission 2016/0382 / Status: 21.06.2018

## Tab. 6: Average oilseed and vegetable oil yields in (t/ha) FY 13/14 to 17/18

| Study | Palm oil[1,2] | Soya[3] | Rapeseed | Sunflowers |
|---|---|---|---|---|
| **Seed yields** OIL WORLD Statistics Update 8 (March 2018) | / | 2.97 | 3.33 | 2.05 |
| **Oil yields** OIL WORLD Statistics Update 8 (March 2018) | 3.89 | 0.60 | 1.33 | 0.92 |
| **Oil yields** according to WWF study* | 3.30 | 0.40 | 0.70 | 0.70 |
| **Difference in oil yields** | | 0.20 | 0.56 | 0.22 |

[1] Vegetable oil/seed yield of the countries: Indonesia, Malaysia
[2] Calendar year instead of fiscal year (FY)
[3] Vegetable oil/seed yield of the countries: Brazil, Argentina, Paraguay, USA
* WWF study "Auf der Ölspur – Berechnungen zu einer palmölfreieren Welt"
Source: UFOP according to information from OIL WORLD (Statistic Update March 2018)

be emphasised that the fulfilment of these targets depends on the availability of the raw materials listed in Annex IX Part A (positive list!). The main problem is that there are practically no plants available to meet this demand. The EU Commission will likely attempt the "hope" principle here. However, the directive includes the option of extending the positive list. The biomass supply is made more difficult by constraints for the plant operators, something which is welcomed by UFOP. They must verify or contractually conclude an operational management for the soil carbon (humus balance/crop rotation systems) with the suppliers. Clariant is currently erecting a plant in Romania with a capacity of 50,000 t of bioethanol for a straw demand of approx. 250,000 t. With an estimated grain yield of 5 t/ha, the catchment area comprises 50,000 ha, already reaching 150,000 ha with a straw removal every three years (humus balance). So this project can be looked at with a sense of expectation. Potential investors will also do this for other projects and consider the experiences accordingly. Measured in terms of biofuel demand, it remains to be seen whether the investments required for this will be realised at all. The demands for sustainable agriculture in the EU (carbon management) are also rising constantly.

In light of the producer price trend for oilseeds and grain in the EU, the farmers must, in the truest sense, clutch at straws in order to survive. UFOP regrets that politics and/or governments are not alleviating market pressure through quota adaptations in order to stabilise the producer price level. However, with a highly problematic raw material, UFOP expressly agrees with the position of the European Parliament.

## Fig. 2: Positive list for residual and waste materials as per Annex IX Part A and B RED II

**Part A.**
**Raw materials for producing modern biofuels with double counting of the energy content**

Biological waste in the sense of Article 3 Paragraph 4 of the directive 2008/98/EC from private households; Biomass share of industrial waste which is unsuitable for use in the food or animal feed chain, including material from wholesale and retail, the agri-food industry as well as the fish and aquaculture industry and exclusively the raw materials listed in Part B of this Annex; Straw, dung/manure and sewage sludge; wastewater from palm oil mills and palm empty fruit bunches; tall oil and tall oil pitch; raw glycerol; bagasse; grape marc and wine lees; nut shells; husks, cobs; biomass shares of waste and residues from the forestry sector and forest-based industries, i.e. bark, branches, pre-commercial thinning material, leaves, needles, treetops, sawdust, wood shavings, black liquor, brown liquor, fibre sludge, lignin and tall oil

**Part B.**
**Raw materials for producing biofuels that can be counted with double their energy content:**

- used cooking oil
- animal fats, Categories 1 and 2

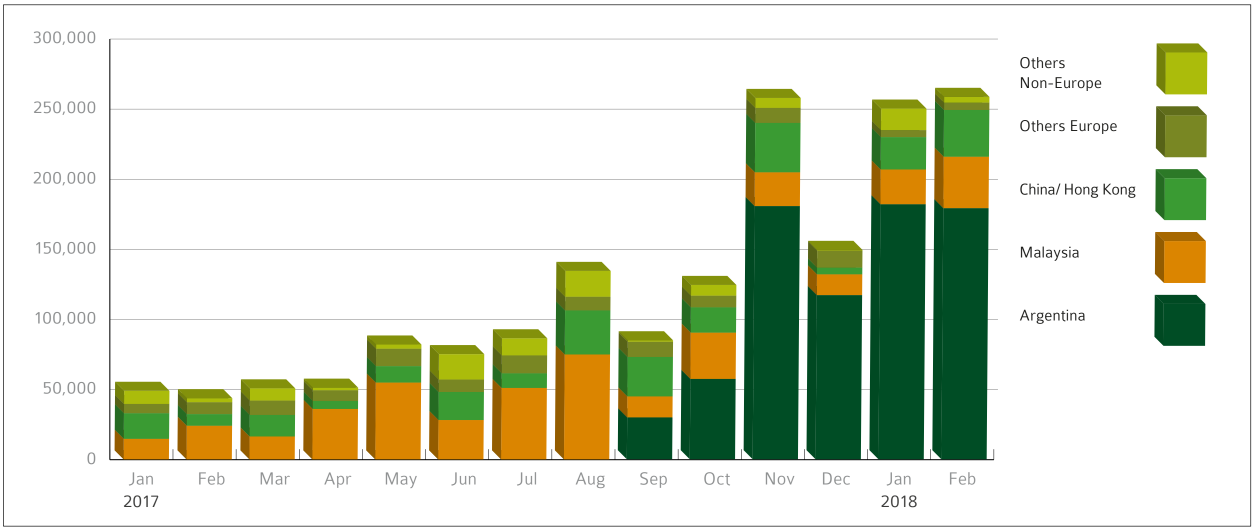
Source: EU Commission, 2016/0382 (COD) / Status: 21.06.2018

## Tab. 7: Amended tariff rates for diesel imports from Argentina 09/2017[1]

| Company | EUR/t[2] 2013 | Dumping margin in % | EUR/t[2] 2018 |
|---|---|---|---|
| Aceitera General Deheza S.A., General Deheza, Rosario,Bunge Argentina S.A., Buenos Aires | 216.64 | 8.1 | 79.56 |
| Louis Dreyfus Commodities S.A., Buenos Aires | 239.35 | 4.5 | 43.18 |
| Molinos Río de la Plata S.S., Buenos Aires; Oleaginosa Moreno Hermanos S.A.F.I.C.I. y A.; Bahía Blanca; Vicentin S.A.I.C., Avellaneda | 245.67 | 6.6 | 62.91 |
| Other cooperating companies | 237.05 | 6.5 | 79.56 |
| All other companies | 245.67 | 8.1 | 76.52 |

Sources: [1]Commission Implementation Regulation (EU) 2017/1578 of 18.09.2017, [2]in t net weight – GTAI Germany Trade & Invest (2013/2018)

## Fig. 3: EU biodiesel imports (t)




Source: F.O. Licht

### The "raw material demand for palm oil"

Particularly the environmental committee of the EU parliament demanded a limit for the use of biofuels made from cultivated biomass and focused the debate predominantly on the subject of palm oil. UFOP welcomed the decision of the parliament from April 2017 to prohibit palm oil for the production and counting of biofuels in the EU. As expected, the position of the EP proved not to be feasible in the trilogue negotiations. In the end, a compromise was made to introduce a limit based on the sales volume in 2019 and a gradual phase-out of biofuels made from palm oil from 2023 to 2030. At the same time, the compromise means that the EU Commission now has time to develop a WTO-compliant regulation in the form of a delegated legislative act (see Pg. 11). The subject of palm oil prohibition had quickly developed into a trade policy field of conflict because the Indonesian government threatened to no longer order aircraft for their own airline in the EU if necessary. The term "palm oil" can therefore not be found in the negotiation result for the RED II. But it does include a regulation that focuses on the testing and sanctioning procedures, particularly land use changes on areas with high levels of soil carbon. This formulation unmistakably means deforestation on moorlands in Indonesia, which emit large volumes of $CO_2$ over many years through humus depletion (see Pg. 10). In view of the above decision, an alliance of palm oil-producing countries against this decision is forming according to press reports. From the point of view of UFOP, it is particularly problematic that the European oilseeds (rapeseed and sunflowers) are classified into the group of crops with a high iLUC risk. In light of this, UFOP and the European Oilseed Alliance (EOA) had reiterated that, with the production and processing of rapeseed to biodiesel quantitatively, the by-product rapeseed meal is produced predominantly. The EU Commission must now issue a report on the land use changes which at the same time evaluates the criteria in relation to the risk of deforestation and planting on soils with high carbon contents on a current scientific basis. From the point of view of UFOP, there is an opportunity here to introduce the known arguments into the forthcoming debate with the EU Commission, EU parliament and member states, which speak in favour of rapeseed as a crop with a low iLUC risk: crop sequence relevance, food source for bees, protein supplier ("protein plant strategy"/GMO-free), compensation for soya imports, recycling economy etc. These links were explained to the public in the UFOP special publication "Rapsanbau statt Regenwaldrodung" (Rapeseed cultivation instead of rainforest clearing). In view of the scientific evaluation of the iLUC risk of biofuels made from cultivated biomass announced in the RED II, UFOP calls for the substitution effect to now be considered in particular. After all, more and more land is also being used for the cultivation of soya in South America. It is worth noting that the debate on the pros and cons of palm oil is very controversial. The World Wide Fund For Nature (WWF), in its study "Auf der Ölspur – Berechnungen zu einer palmölfreieren Welt" (Looking for the oil slick: calculations for a world free of palm oil) supports the use of palm oil in the food and chemical sector on account of it being "non-substitutable due to the fatty acid-specific properties" and justifies this, among other things, with the high output efficiency of the palm oil plantations (see Pg. 14). As you can see from the table, the vegetable oil yields per hectare for rapeseed are clearly calculated deliberately low in order to underline the yield efficiency and thus the lower land demand for palm oil production. The GMO-free rapeseed meal production, however, is not considered in the study of the WWF. The WWF presented this study in a meeting of the UFOP Expert Commission "Economy and Market". The vegetable oil yields have been strongly criticised by members of the Expert Commission; the need for correction particularly for rapeseed was strongly urged. This has not happened as yet. From the point of view of UFOP, the demand gap in the event of a phase-out of palm oil with European rapeseed oil could be closed and the rapeseed market finally given a positive boost in the producer price trend again. This hope can only be sustainably revived if the subsidised biodiesel imports from Argentina can be confined.

## Biodiesel imports – EU is arguing with Argentina again

The tariff dispute between the USA and the European Union was one of the most dominant economic matters during the reporting period, and will continue to be. Less prominently affected is the European biodiesel industry. The fact that the US administration not only set tariff barriers on steel and aluminium, but some months previously also for biodiesel imports from Argentina, which led to a tangible reorientation of export flows in the EU's direction, has almost been forgotten. Under pressure from the soybean farmers and the biodiesel industry, the US government verified biodiesel imports from Argentina with tariffs between 71.5 and 72.3 % of the goods value. After the US market was practically blocked overnight for the export, the Argentinian biodiesel industry diverted its export to the EU once the proceedings of the Argentinian and Indonesian government at the World Trade Organisation (WTO) against the anti-dumping tariffs imposed by the EU were successful. As a result, the EU Commission had to lower the import tariff rates to a level which is no longer effective (see Pg. 15). During the months September 2017 to February 2018, around 1 million t of biodiesel from Argentina had already been introduced to the EU (see Pg. 16).

By contrast, the European Biodiesel Board (EBB) with its member companies has successfully put pressure on the EU Commission and on the respective governments, resulting in the EU Commission first of all only initiating new proceedings against Argentina. UFOP, too, had turned to the relevant departments (BMWi and BMEL) with an equivalent initiative and expressed its fear that in particular biodiesel made from rapeseed could be displaced. The association initiatives resulted in the EU Commission initiating anti-subsidy proceedings against Argentina at the beginning of 2018. The EU Commission thus recognises the continued subsidy practice of the Argentinian government for promoting exports: The export tariffs are differentiated in such a way that the soybeans are taxed by far the highest, whilst biodiesel is taxed the lowest. The soybean processing is thus kept on the domestic market. This also explains why Argentina is the world's biggest soybean meal exporter. The added value is based on the soybean meal share (approx. 80 %) and its price trend. The resulting soybean oil and/or the processed soybean methyl ester must, however, be exported, since the volume cannot be accommodated by the diesel fuel market, even with an admixture quota raised to 10 %. However, a nationwide admixture of 10 % is also reaching logistical limits in Argentina.

The new proceedings against Argentina are expected to be completed in the autumn of 2018. But in order to increase pressure against further imports as quickly as possible, the associations asserted that the import volumes have to be registered. The corresponding Implementing Regulation for registering the introduction of biodiesel from Argentina came into effect in May 2018. In the event of a positive outcome of the proceedings, the corresponding EU tariffs for the registered volumes would have to be recovered. The Argentinian exporters thereby risk high additional payments. The result of the proceedings against Argentina will be indicator for the tariff-setting against Indonesia according to the assessment of UFOP. The Argentinian government has raised export tax from 8 to 15 % as of 1st July 2018. They didn't do this due to the threat of new EU tariffs, but to generate additional revenue for the national budget. However, this will do little to alleviate export pressure. The bills are paid by the soybean farmers, who counter-finance this export system with low bean prices to the huge benefit of the processing industry. For the proceedings and determination of the new tariff rates, data and information must be acquired from companies of the Argentinian soybean processing industry. Interestingly, the same companies that are involved in the oilseed and biodiesel sector in the EU are also active in Argentina. The result will have a major determining influence on the sales potential of the European biodiesel industry and thus the demand for rapeseed oil for producing biodiesel. At this point is should once again be emphasised that the production of rapeseed meal for GMO-free protein supply is also contingent on European rapeseed processing. From the point of view of UFOP, it would be absurd if Argentina was able to not only secure a considerable market share of the EU biodiesel market, but also additional soybean meal exports. The EU Commission had recently represented very liberal positions with regard to EU protein supply in connection with global trade negotiations, which almost conflict with the EU protein plan.

## Biodiesel sales slightly higher in 2017

Although the GHG reduction requirement in 2017 rose from 3.5 to 4.0 % and the overall consumption of diesel fuel (incl. biodiesel) to the historic record value of 38.405 million t, the biodiesel sales compared to the previous year at 2.132 million. t remained practically unchanged (see Pg. 18). In the trend in biodiesel consumption, which has been stagnating since 2015 and which includes Hydrogenated Vegetable Oil (HVO), UFOP sees further confirmation that the GHG efficiency competition open to biomass raw material and technology has consistently improved resource efficiency. With the entry into force of the amended 38th Federal Immission Control Ordinance (38th BImSchV), further options can be used for meeting the GHG reduction requirement in future, among others the "Power to Gas" technology. The prerequisite for this is that the power used for hydrogen production is 100 % renewable. For the methane produced in this way for feeding into the natural gas line, the ordinance stipulates a $CO_2$ value of just 3 g/MJ. The GHG reduction requirement raised for the quota year 2017 would have had to lead to an increased demand of around 0.3 million t of biodiesel in conjunction with the higher diesel consumption volume. In fact, this was only 66,000 t compared to 2016. UFOP expects that the Evaluation and Progress Report to be presented by the German Federal Office for Agriculture and Food in the autumn will once again confirm the high share of biodiesel made from waste oils. Efforts to also approve animal waste fats for the production of biofuels in Germany are being continuously denied by UFOP in view of the market situation in the vegetable oil markets.

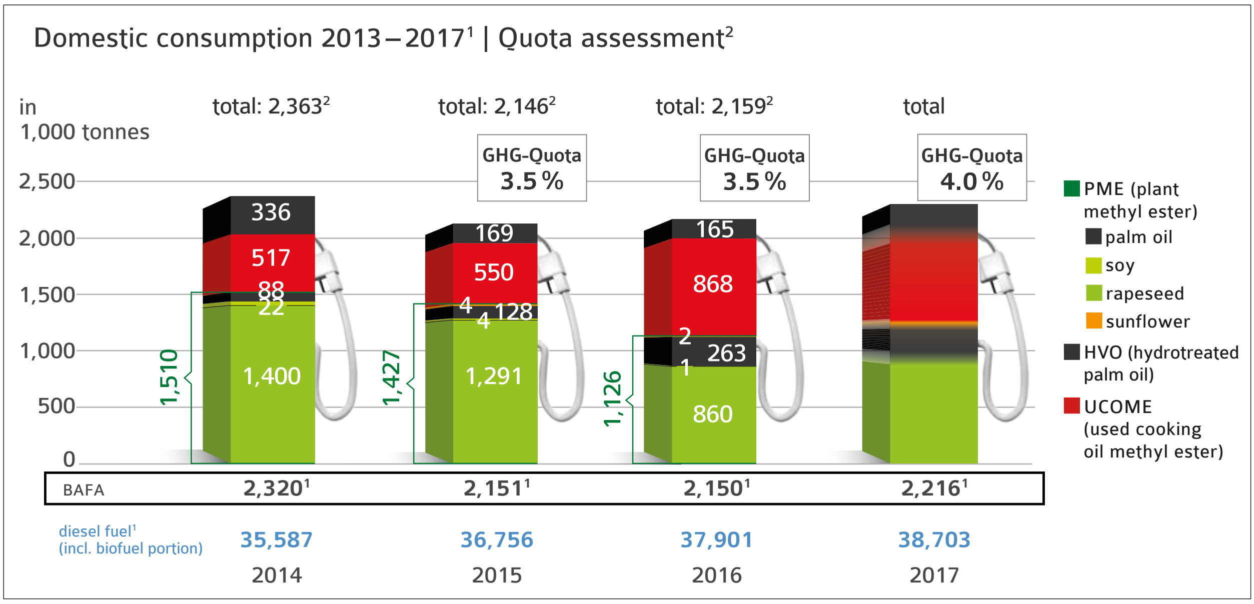
## Biofuels in agriculture and forestry – UFOP questions approval procedure

UFOP provides weekly information on the trend of wholesale prices for biofuels (rapeseed oil/biodiesel) and agricultural diesel. Figure 5 illustrates the price benefit for the respective biofuels, measured by price for tax-privileged agricultural diesel. In the second quarter of 2018, the price benefit rose due to the price trend of raw oil. Biofuels are attractively priced with a full tax refund. At the same time, the gradient of the price curves illustrates the difference in the price trend for diesel and vegetable oil and also confirms the high margin and price pressure of the international vegetable oil markets. The use of biofuels in agriculture and forestry is therefore an important option for liquidity improvement, for market relief and for climate protection. The so-called "Oat principle" for the operational use of rapeseed oil as a sustainable liquid energy source with high energy density underlines the multiple use that meets with the highest level of acceptance amongst public and environmental associations. This is recycling economy in practice.

The climate protection aspect of biofuels will come to the fore in the short to medium term because agriculture and forestry must also make their sectoral contribution to the GHG reduction by 2030. This obligation will be embedded in the billed climate protection law. Starting from the base year 1990, the agricultural sector must reduce GHG emissions by around 30 million. t of $CO_2$ equivalents in total. A major part of this reduction has been achieved. In 2014, the GHG emissions were 72 million t. This means that agriculture still has to overcome a reduction of approx. 14 million t of $CO_2$. The viewpoint of UFOP is clear: Biofuels in agriculture and forestry are included; they can make a tangible and sustainable contribution (see Fig. 8). According to calculations by the Bavarian Technology and Support Centre in the Centre of Excellence for Renewable Resources (TFZ -Technologie- und Förderzentrum), this could well be a third.

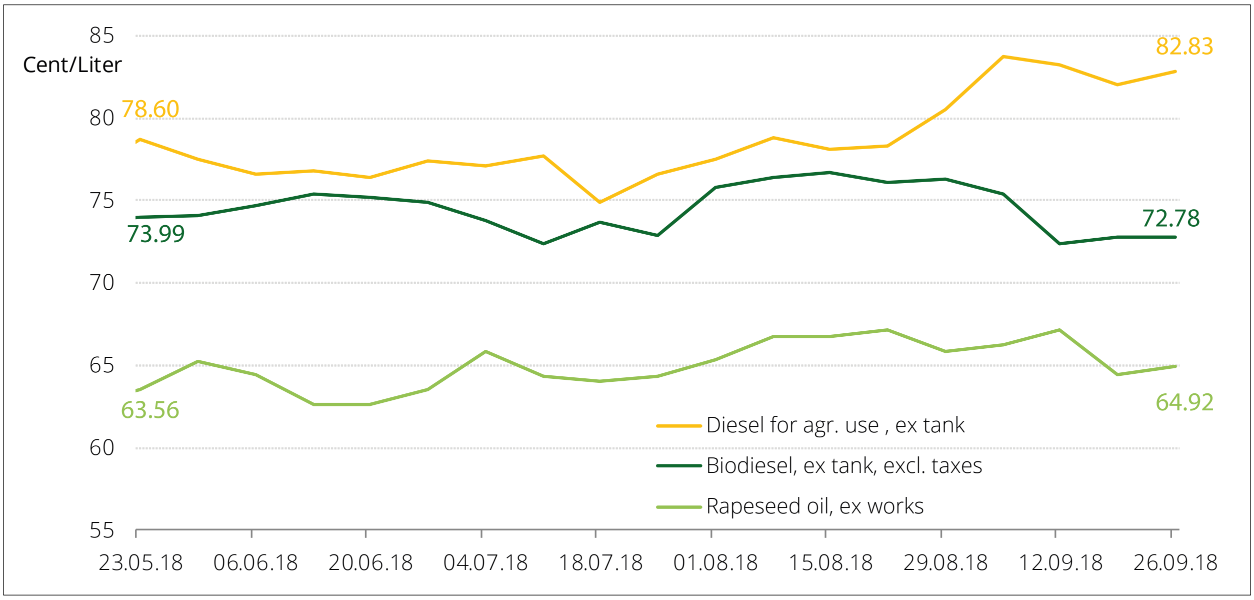
At the beginning of July 2018, the EU Commission completed the approval procedure under state aid law for the tax relief for biofuels used in agriculture and forestry after a waiting period that UFOP found to be inexplicably long. Section 57, Paragraph 5 of the Energy Tax Act regulates the tax relief for agriculture and forestry businesses. For biodiesel and/or rapeseed oil fuel, this is 450,00 EUR per 1,000 l. In contrast, the relief for agricultural diesel is 214.80 EUR per 1,000 l. In the case of biofuels, the farmer therefore gets back the full energy tax paid on request. Whilst the notification process for continuing the refund scheme for agricultural diesel was completed quickly by the EU Commission, the completion of the test for biofuels was delayed month after month. UFOP had reiterated its position to BMEL that the tax relief of biofuels does not relate to the promotion of biofuels as such, but rather to a potential "raw material-independent" relief of "energy products" according to the Energy Tax Directive – fossil or biogenic is irrelevant – for supporting agriculture (liquidity aid). For tax-privileged fossil diesel, there will also be no demand for an environmental assessment. The standards for this approval under state aid law are not relative according to the core of the criticism of UFOP. The areas of application of this guideline are regulated in the notification of the EU Commission on the guidelines for state-run environmental protection and energy subsidies 2014–2020 (2014/C 200/01) for promoting renewable energies, amongst other things. In this case, the subject of the assessment was the question as to whether the subsidy for biofuels for which there is a supply or admixture obligation will be guaranteed. In this process, the BMEL was able to prove that this is not the case and that these biofuels are also more expensive than fossil diesel fuel. However, this guideline restrictively

**Fig. 4: Sales trend for biodiesel in Germany | Raw material composition | Diesel consumption**



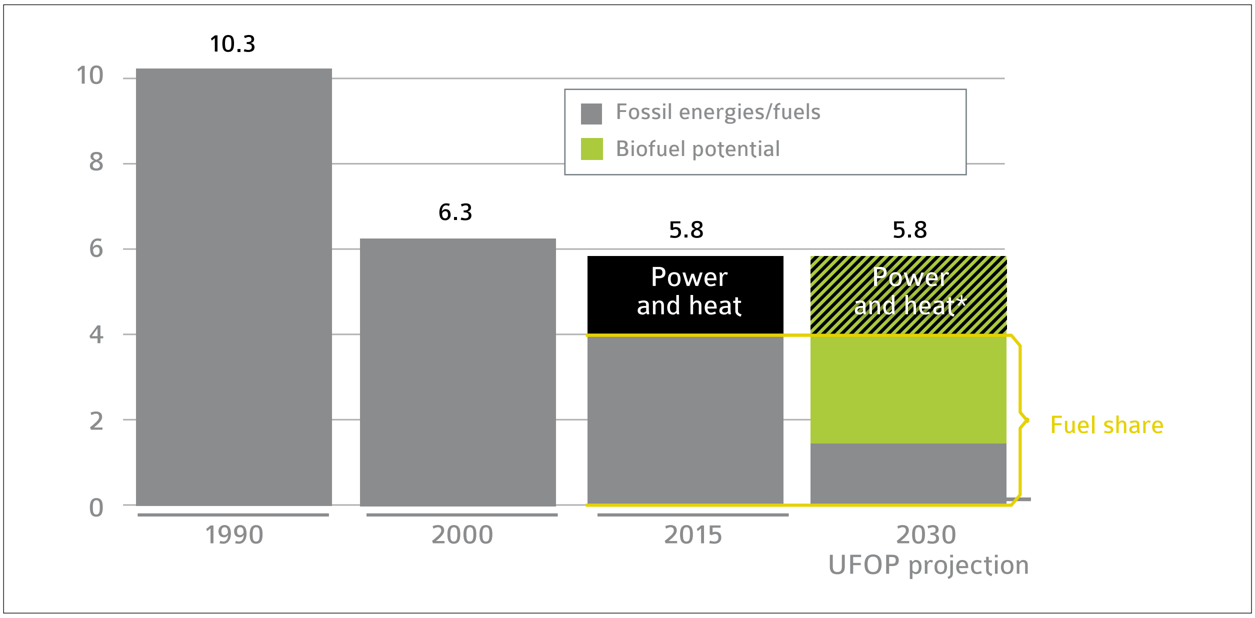

Source: [1]BAFA, [2]BLE, [3]BLE Evaluation Report 2017 expected for October 2018 intends for the promotion of biofuels made from "food crops" to be approved at the latest by 31st December 2020. The approval of the EU Commission therefore intends to continue the previous tax relief to its full extent, but with a restriction until the end of 2020. From the point of view of UFOP, urgent action is now required to lay the foundations for continuing the tax-privileged use of biofuels made from rapeseed oil in agriculture beyond the year 2020. This is because, in turn, the previously described justification for the limitation that practically only biofuels made from waste oils and fats would be eligible. Furthermore, the justification of the limitation for the eligibility of biofuels made from cultivated biomass raises the issue of whether there are any reservations surrounding the eligibility of renewable raw materials made from cultivated biomass. This is because it is not plausible for the eligibility of a renewable raw material to be linked to the

## Fig. 5: Wholesale price trend for biofuels




© AMI GmbH 2018. Note: Rapeseed oil and biodiesel for use in agriculture exempt from energy tax, agricultural diesel partially taxed at 25.56 Cent/l, all prices without transport costs

## Fig. 6: Agricultural emissions through energy use (in million t $CO_2$ equivalent)




* GHG reduction potential through use of power and heat from biogas plants, wind power and photovoltaics
Source (until 2015): National greenhouse gas inventory reports
© DBV, climate strategy 2.0, 2018

intended use of biofuel. This regulation supports the tiresome food/fuel debate, which, in view of the actual global supply situation, is considered long since obsolete. This debate can be transferred to all other end uses of renewable raw materials, at the latest when the demand also triggers a corresponding requirement for arable land. The target of state funding, which also increases the producer price and thus revenue as part of the so-called bioeconomy strategy in the area of material use of renewable raw materials, would practically come to nothing with the consistent expansion of this regulation. The loser would also be climate protection because what alternative carbon source could be used in the short term – and on a global scale? Establishing a bio-based economy on residual and waste materials is utopian and controversial with regard to the available raw material quantities and the excesses in the global markets for grain, sugar and vegetable oil. An honest debate must finally be held here between politics, public and economy. UFOP will push ahead this debate, since the introduced caps for biofuels made from cultivated biomass were already the signal for also having to introduce a "cap" for all other end uses. The federal government is urged here to adopt a clear stance with regard to the continuation of the bioeconomy strategy.

## $CO_2$ price – $CO_2$ tax – emissions trading?

With the reform of European emissions trading, rising certificate prices are already apparent in the trading sectors. Slowly but surely, climate protection is being priced more highly. With regard to the obligations within the framework of the effort-sharing guideline, effective $CO_2$ price signals have to be established in the non-trading sectors, not just in Germany, but also in the EU. Without market-driven instruments, climate protection advances too slowly and becomes too expensive for the taxpayer due to the necessary incentives. How efficiently this can work is confirmed by the GHG reduction requirement for fuels implemented in Germany in 2015. The RED II rightly stipulates this option explicitly for the member states. Because with the current promotion of e-mobility, a disproportionate tax concession framework is developing due to the combination of tax deficits and other direct and indirect promotional measures. In light of this, the Umweltministerkonferenz des Bundes und der Länder (UMK - Conference of Environment Ministers) welcomed the initiative of the French National President Emmanuel Macron, together with Germany and other countries, to strengthen $CO_2$ pricing based on a coordinated effort and joint initiatives.

The UMK thus called upon the federal government to submit proposals which cover the following elements:

- The $CO_2$ pricing should take all sectors into account: electricity generation, heat and mobility.
- Involving all sectors in EU emissions trading, on the other hand, is not productive and not practicable.
- The level and trend of the $CO_2$ prices must have a socially acceptable structure, be geared to achieving the long-term climate protection goals and be part of an extensive review of subsidies, which provide climate-damaging stimuli.
- The $CO_2$ pricing should be accompanied by other instruments so that undesirable economic results are also ruled out in cross-border trading and exchange.

The main focus of the environment ministers is the transport sector, since it has thus far hardly made any contribution towards GHG reduction. By contrast: the GHG emissions rose by around 10 million t of $CO_2$ to 170 million t. between 2014 and 2017. The technological advancement in engine efficiency is being exhausted by customers' preference for bigger vehicles and increasing new approvals. The environment ministers and the EU Commission expect a greater $CO_2$ reduction in the transport sector due to the tightening of $CO_2$ limits for passenger cars and light commercial vehicles from 2021 (95 and/or 147 g $CO_2$/km) as well as 2025 and 2030. Furthermore, the EU Commission demands that the manufacturers ideally bring 30 % of the new cars with electric or other alternative power trains onto the road by 2030. In contrast, it provides 800 million. EUR for the development of charging stations for electric cars in the whole of Europe. However, for the sake of clarity, it must not be overlooked that the rise in GHG emissions in Germany is also a result of the good economic development.

In the spring of 2018, the EU Commission carried out an EU-wide survey for amending the energy tax guideline. It remains to be seen how the EU Commission will formulate the proposal (combined $CO_2$/energy tax) and, above all, when this will be introduced. The time pressure is enormous and it is down to the member states to come to a unanimous decision, as is the case with all tax-related issues.

## Is Brazil the trendsetter in emissions trading with biofuels?

In mid-July 2018, it transpired that Brazil is setting emission reduction targets with the "RenovaBio" programme. According to Germany Trade and Invest (GTAI, Gesellschaft Deutschlands für Außenwirtschaft und Standortmarketing) the project was introduced for a support programme for biofuels in December 2017. The emissions targets were announced in June 2018. A year by year staggered reduction of the $CO_2$ emissions from fuels of 10.1 % in total by the end of 2028 is forecast. With this decision, Brazil lays the foundations for domestic GHG pricing and for trading emissions rights in the domestic market, even if only the fuel sector is covered. As of 2020, fuel sales companies aim to meet individual targets due to be published in the first half of 2019 and request $CO_2$ certificates, called CBIOs, for them. CBIOs are offered by biofuel producers, who receive these from accredited testers according to their $CO_2$ efficiency. According to government estimates, the additional revenue from trading with CBIOs will stimulate the production of biofuels and promote consumption. According to calculations of the Energy Policy Council, the demand for bioethanol and biodiesel will more than double. In accordance with this, it is expected that around 28.5 million t of bioethanol and 9.7 million t of biodiesel will be consumed in 2028. To this end, the Council proposes to increase the admixture share in diesel fuel from currently 10 to 15 % in 2022 and to 20 % in 2030. This set of measures is coupled with the expectation that the economic situation of biofuel producers will improve. Especially for the Brazilian sugar cane industry, the RenovaBio programme has come at the right time. Due to the low price policy for fuels between 2011 and 2014, as well as the subsequent recession, ethanol producers had to suffer heavy losses. In the past decade, 80 factories stopped operations and another 70 are still having financial difficulties. Other features include the surplus supply in the global sugar market and the dumping prices of producers from Thailand and India, which make exporting Brazilian sugar uneconomical. The problem with the structural excesses is global, as UFOP continuously stresses. In conjunction with further regulatory measures, biofuel policy is an important option for making a contribution to climate protection with biofuels made from cultivated biomass right now. The food/fuel debate does not present itself in this way; the climate protection in transport then takes place outside the EU with biofuels. This example confirms the opinion of UFOP that the EU chose to act alone in the global community with its raw materials policy for biofuels. The Paris climate agreement drives countries like Brazil to funding policy measures concepts, as described previously. Let us hope that this example will inspire others and that eventually the market relief will also be apparent in the EU's agriculture, particularly since the EU is inhibiting the use of existing biomass potentials with the RED II.

# Expert Commission "Biofuels and renewable resources"

On the day before the meeting of the Expert Commission on 20th June 2018, a joint workshop of UFOP and the Fuels Joint Research Group (FJRG) took place on the subject of "Polarity of fuels". The workshop served as an inventory of the research projects supported by UFOP, the Agency for Renewable Resources (FNR), the Research Association for Combustion Engines (FVV) and other project sponsors. Measured in terms of global significance, biodiesel in particular as a polar component in various admixture proportions presents the development and security of fuel quality with great challenges. However, the share of non-polar biofuels such as Hydrogenated Vegetable Oil (HVO) and longer-term electricity-based renewable fuels (power-to-liquid) is rising. Also challenging is the fact that the dwell times of the fuel mixtures are extending in the vehicle tank as a result of increasing hybridisation of the power trains. In light of this, systematic research must be proactively intensified in order to check the functionality of the various fuel mixtures, ideally while the vehicle is running, and/or to combine them in the best possible way during production according to the outcome of the workshop. Comprehensive reporting on completed and ongoing project proposals preceded this debate. Of vital importance was the question of what functional role biodiesel can play, not only to ensure lubricity, but in future also as a solubilising agent in non-polar fuels. In the participants' view, the results of the presented project proposals are not only significant for national and European development, but generally for the global development of fuel strategies in all parts of the world. The presentations are available at www.ufop.de/FJRG-UFOP-Workshop.

### Biofuel policy and market development in Germany and in the EU

In the week before the meeting of the Expert Commission, the negotiating partners of the trilogue procedure agreed on a compromise for revising the Renewable Energies Directive (RED II). This way, the members were promptly informed of the results and potential consequences for the further development of the biofuel sector in the European Union were discussed. The rise in the target value for the share of renewable energies in the final energy consumption to 32 % and the projection of the binding share of renewable energies for the member states in the transport sector of 10 % in 2020 to 14 % in 2030 was welcomed. The counting options for fulfilling this target were viewed with criticism. With these options, fuels from waste and residual materials, as well as the share of renewable electricity in e-mobility and in rail transport can be counted several times. As a consequence of complex regulations and national authorisations for defining the so-called caps for biofuels made from cultivated biomass, the Expert Commission fears a hotchpotch of legal regulations in the member states. The integrated energy and climate plans, which have to be submitted by the member states to the EU Commission at the end of 2019, are therefore highly anticipated. In light of this, Claus Keller, F.O. Licht, provided information on the situation and sales prospects of biodiesel and HVO in the European markets. The development that the share of biofuels, especially those made from waste oils and fats, and the increasing share of HVO particularly drives out biodiesel made from domestic raw materials has been confirmed. Biodiesel exports are therefore of central importance for the utilisation of the European production plants. A further issue is a volume and price pressure that was already noticeable at the end of 2017 and the beginning of 2018 as a consequence of the WTO verdict and the associated tariff reduction on biodiesel imports from Argentina. At the same time, the global supply of vegetable oil is expected to rise to over 200 million t. The supply pressure is recognisable from the low producer prices for all significant agricultural raw materials such as grain, sugar beets, sugar cane, oilseeds and palm oil, although the oilseed and grain yield in 2018 in the European Union is overall not very satisfactory.

### Climate protection in the transport sector

Prof. Dr. Christian Küchen, Managing Director of the Association of the German Petroleum Industry (MWV), presented the strategic approach of the German and European petroleum industry for preserving and developing liquid renewable fuels in the sphere of European and national climate protection targets in the transport sector. He emphasised the necessary technology-neutral and non-discriminatory approach. In view of the globally rising fuel demand, which will continue rising in future, liquid synthetic fuels made from renewable electricity (Power-to-X) are a future option, also for the technology site in Germany. In sectors with a high power demand (heavy goods transport, off-road, sea and air transport), liquid renewable fuels, which additionally ensure transition to an ideally greenhouse gas-neutral power train in the long term together with the electrification of power trains, including in the passenger car area, remain without an alternative. It is an evolutionary process, which can only be implemented if the future of the combustion engine is not questioned at the same time, but can be further developed in conjunction with the electric power train (hybridisation) with the aim of improving efficiency. This finding is confirmed by, amongst others, the current dena pilot study, which Prof. Dr. Küchen presented. In view of the implementation of e-mobility, the exceptionally high subsidy was criticised when considering all factors such as tax deductions, state investment aids for infrastructure development (charging stations) etc. With its potential for short to medium term decarbonisation of fuels, the existing refinery structure for the strategy development in the climate protection plan and the billed climate protection law should not be overlooked if the transport sector is going to reduce greenhouse gas emissions by 42 % or approx. 70 million t $CO_2$ by 2030. Prof. Dr. Küchen explained the GHG reduction options according to the concept "Vision 2050", which was developed by Fuels Europe, the European petroleum industry association (www.fuelseurope.eu).

### Power train and exhaust gas aftertreatment concepts for the future

Markus Winkler, Deutz AG, introduced the strategic approach of the company for further development of the power train concepts in consideration of customer demands. An electrification in the off-road area is practically impossible due to the high power demand. The solution, therefore, is further development on the fuel side, starting with biofuels, which, like biodiesel, are available on the market today, and future renewable synthetic fuels, which will determine the supply in the long term. During the Agritechnica in Hanover, Deutz AG had granted approval for biodiesel as a pure fuel (B100) as the result of a project proposal (see "Completed projects" below) supported by UFOP and FNR. However, it was also stressed that with the increasing emission requirements, the expense for test bench runs and for the certification for type-specific approval is also increasing.

With reference to the effects of the diesel scandal and the ongoing debate on driving bans in city centres, Dr. Jörg-Ullmann, Robert Bosch GmbH, presented the concept developed by his company for an ideally cost-effective optimisation of exhaust aftertreatment for reducing $NO_x$. On the basis of a standard vehicle, all options for an optimum $NO_x$ reduction (optimisation: turbocharger, injection system, temperature management in conjunction with new software functions) were exhausted with the result that currently applicable and tightened $NO_x$ limit values can be fulfilled. Dr. Ullmann assumes that the transport-related share of $NO_x$ will be significantly reduced and the intercity nitrogen oxide emissions and/or compliance with the legal limit value for air pollution control will be primarily determined by emission sources such as building heating systems due to the gradual market access of this new technology.

### OME – Fundamental research and development of specifications

OME (oxymethylene ether) has developed into a fuel component in which the vehicle industry is showing a great interest in a relatively short period of time. The background is the development of processes for producing OME, whose energy source can also be renewable electricity, meaning that this fuel component has a significant greenhouse gas reduction potential. Although OME is still primarily produced in China, the increasing activities in the field of fuel research on published test bench trials underline the rising interest, but at the same time also the urgent need for action for creating a specification, stressed Dr. Thomas Wilharm, ASG Analytik-GmbH, in his presentation. The development of a specification (DIN 51699) began in the spring of 2018 as part of a national initiative. After presenting the chemical properties, Dr. Wilharm in particular demonstrated the extensive need for action in developing test methods. Test methods used for diesel fuel cannot be used for many fuel parameters. On the other hand, the specification of this new fuel is a mandatory requirement for comparing findings. From the point of view of UFOP, OME is interesting as an admixture component of diesel fuel because rapeseed oil methyl ester (RME) proved to be a very suitable solvent in initial tests for keeping OME/diesel fuel mixtures in solution. A problem with OME is the low density, which can lead to a phase separation. The Expert Commission discussed the research requirement and recommended the pursuit of this approach as a further application option for RME.

### UFOP project promotion

The Expert Commission members have been informed of the status of the following UFOP-promoted project proposals:

- The development of an on-board sensor system for early identification of deposit formations in biodiesel fuels, Automotive Technology Transfer Centre (TAC) of the University of Coburg
- Fuels for PHEV vehicles, Automotive Technology Transfer Centre (TAC) of the University of Coburg, OWI Aachen (Oel-Waerme-Institut)
- SAVEbio – Strategies for deposit prevention at injection nozzles for multi-fuel use of biogenic fuels.

The subject of the meeting was the discussion of the draft of a position paper "Zur Perspektive des Verbrennungsmotors im Umfeld emissionsrechtlicher und klimapolitischer Herausforderungen – Handlungsfelder und Forschungsbedarf" (On the perspectives of the combustion engine in the field of emission and climate policy challenges – Fields of action and research demand).

The strategy paper is expected to be published in autumn 2018.

## Ongoing projects:

### Fuels for Plug-in-Hybrid Electric Vehicles (PHEV)

#### Project support:

OWI Oel-Waerme-Institut gGmbH, Kaiserstraße 100, 52134 Herzogenrath
TAC Automotive Technology Transfer Centre (TAC) of the University of Coburg,
Friedrich-Streib-Straße 2, 96450 Coburg

#### Running time:

May 2017 to December 2018

As a result of the constantly increasing climate protection obligations as part of the decarbonisation of the transport sector, the adjustment of the power train will develop in an evolutionary way in parallel. The legislation for $CO_2$ reduction per kilometre is forcing vehicle manufacturers to increase electrification in combination with the combustion engine so that the current overall range can be secured as far as possible. The combustion engine thus remains indispensable for the time being. However, The ambitious $CO_2$ reduction target of 95 g of $CO_2$ per kilometre, which must be implemented from 2020, will speed up market introduction of hybrid vehicles. This will change the consumption behaviour of car owners to a greater or lesser degree in relation to the preferred use of an electric or motor fuel power train. This will also change refuelling patterns and thus the service lives of the fuel mix in the vehicle tank. This, however, is not a homogeneous mixture, but is made up of various fossil components (depending on the origin of the raw oil) and different organic contents such as biodiesel and/or HVO. In conjunction with the longer service lives of the fuel in the tank, the hybridisation and thus constantly increasing electric range lead to interaction and/or ageing processes, which can be influenced by biodiesel as an oxygen carrier.

This is the subject of this project. As part of a Germany and/or EU-wide representative EU fuel matrix, the ageing behaviour is to be examined according to the expected "tank behaviour", and not just in relation to the chemical ageing process, but also in view of interactions with fuel-carrying components. The project will be supplemented by a further fuel matrix, which only stipulates rapeseed oil methyl ester (RME) as a blend component.

### Development of an on-board sensor system for early identification of deposit formations in fuels containing biodiesel

**Project support:**
Coburg University of Applied Sciences,
Friedrich-Streib-Straße 2, 96450 Coburg

**Running time:**
November 2016 to October 2019

The ageing of fuels is of particular significance in the context of the market introduction of plug-in hybrid vehicles. Due to the predominant electric operation, the service lives of fuels in the tank will extend considerably. This may lead to the formation of unwanted ageing products. It is conceivable that biofuels will become a focus as a cause of negative interaction effects, even if this is only justifiable to a limited degree. Intensive and proactive investigations are required here for determining the complex effects. The aim of the project proposal is to develop an on-board sensor which not only prevents misfuelling, but, especially in connection with the engine management, ensures that the emissions standard EURO VI can be fulfilled with B7 or various mixture proportions of biodiesel and diesel fuel. Furthermore, the ageing degree of the fuel in the vehicle is to be determined so that the use and/or the required exchange of fuel can be displayed by a signal when necessary. In this case, the combustion engine starts up and consumes the ageing fuel.

### Storage stability of fuel mixtures made from biodiesel (FAME), HVO and diesel fuel

**Project support:**
TEC4FUELS GmbH, Kaiserstraße 100, 52134 Herzogenrath

**Running time:**
July 2016 to July 2018

Due to the fact that various biofuel mixtures (biodiesel, HVO, UCOME) are increasingly being admixed with diesel fuel, the question of interactions over a prolonged storage period is raised. The influence that various types of biodiesel (RME, SME, PME and UCOME) have on the long-term stability in fuel mixtures consisting of FAME, HVO and diesel fuel is to be examined in particular. The question of interaction effects is significant, among other things in relation to the also politically supported electrification of road transport and thus accelerated market introduction of plug-in hybrid vehicles. The primary focus of driving behaviour on the e-drive leads to corresponding extension periods of tank filling depending on the user.

### SAVEbio – Strategies for deposit prevention at injection nozzles for the multi-fuel use of biogenic fuels

**Project support:**
OWI Oel-Waerme-Institut gGmbH (project coordinator), Kaiserstraße 100, 52134 Herzogenrath

Technology and Support Centre in the Centre of Excellence for Renewable Resources (TFZ), Schulgasse 18, 94315 Straubing

**Running time:**
October 2016 to March 2019

At the centre of this extensive joint project lies the question of deposit formation of vegetable oil fuels in modern common rail engines. Increasingly higher injection pressures, the requirement for lower fuel consumption and optimised combustion behaviour by means of so-called multiple injection are increasingly reducing the tolerance ranges in the injection systems, especially with respect to the injectors. Even the smallest deposits can lead to significant carbonisation effects, performance reduction and increased exhaust emissions. At the TFZ, the bench tests are carried out with tractors. After the endurance tests, the injectors are removed from the injection nozzles and evaluated. The results are in turn compared with test bench runs (ENIAK) for evaluating the deposit formation at the OWI Institute. Corresponding test bench runs (injection pressures, processes, temperatures etc.) can be simulated at the test bench of the OWI. However, real test runs are required for comparing the results. The causes of deposit formation can be verified and individual influence parameters changed for identifying causes at the ENIAK test bench. As a result, a comparison between the actual deposits at the test bench and the simulation is possible. This way, the goal can be pursued for investigating the formation of deposits at certain critical operating points and developing reduction strategies. Furthermore, in cooperation with the additive manufacturer ERC, causes for deposit effects are to be examined and additive concepts developed for their prevention.

## Projects completed in the reporting period:

### Research scholarship for "Untersuchungen zur Schlammbildung im Motoröl beim Einsatz biogener Kraftstoffe" (Investigations on sludge formation in the engine oil when using biogenic fuels)

**Project support:**
Coburg University of Applied Sciences, Friedrich-Streib-Straße 2, 96450 Coburg

**Running time:**
September 2013 to February 2018

During this scholarship, investigations were carried out to discover what influence engine oil and its composition in conjunction with biodiesel input and its ageing products (proportion of oxygen in the biodiesel) have on corresponding polymerisation effects. A comprehensive literature review was carried out and impacts of biodiesel investigated on the basis of so-called model substances. It was possible to identify the reaction products obtained here analytically for the first time with the result that not only biodiesel, but also compounds of engine oil and/or components of the diesel fuel which have also entered the engine oil lead to oil sludge formation. With liquid chromatography quadrupole time-of-flight mass spectrometry (LC-QTOF-MS), it is possible to determine the molecular structure of larger masses. At the focus of further investigations of these substances with this measuring instrument was the determination of the molecular structure, which provides insight into the composition of the polymerised molecule and its "origin" – biodiesel, engine oil and/or diesel fuel. At the editorial deadline, the final promotion work was not yet submitted.

### Operating behaviour of industrial and agricultural machinery engines exhaust stage EU COM IV in biodiesel operation (B100)

**Project support:**
Institut für Kolbenmaschinen und Verbrennungsmotoren (Institute of Piston Machines and Internal Combustion Engines), University of Rostock, Albert-Einstein-Straße 2, 18059 Rostock

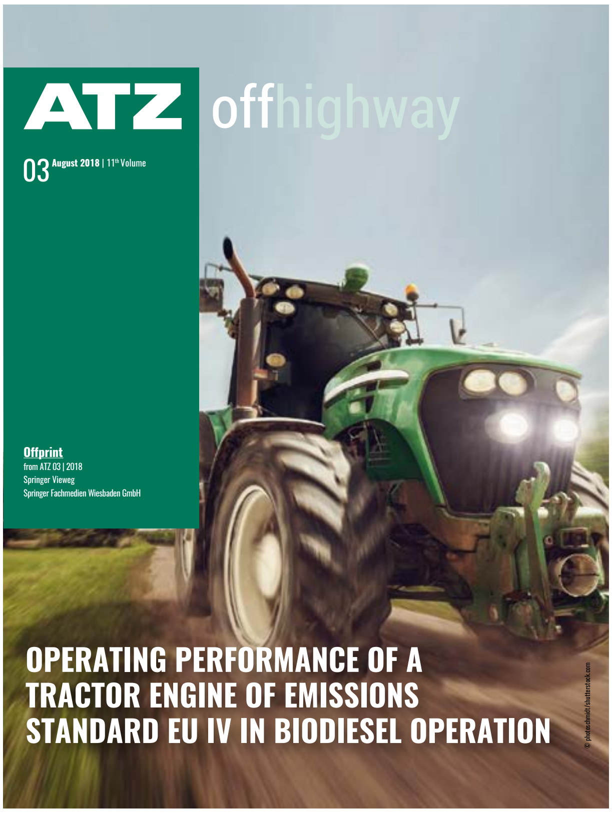
**Running time:**
January 2015 to February 2018

With this project proposal, completed in February 2018, collaboration with DEUTZ AG was continued with great success for the granting of approval of biodiesel as a pure fuel. The goal of a pure fuel approval for the next engine generation was achieved, thus ensuring that the "transition" was retained in this respect. The project proposal covering six work packages included the testing of B100 with respect to compatibility with a modern exhaust aftertreatment system for ensuring interference-free operation. The background is the fact that, with this exhaust gas class also in the off-road area (e. g. agriculture, construction machines), the so-called on-board diagnostics (OBD) is introduced. As part of a load operation lasting several months on the test bench, the following investigations were carried out:

- Measurement of the emissions before and after exhaust aftertreatment;
- Function control of the particle filter regeneration;
- Determination of conversion rates in the exhaust train (SCR – urea utilisation for $NO_x$ reduction);
- Analysis of OBD function;
- Rail pressure behaviour;
- Cold start behaviour;
- Biodiesel input in the engine oil;
- Determination of wear metals in the engine oil, soot proportion, viscosity and density.

The project report was published to generate publicity: www.ufop.de/b100.

Deutz AG had granted approval for the international exhibition Agritechnica in 2017: www.ufop.de/deutz.




Project special publication

# Tabular annex

## Biofuels



## Biofuel mandates



## Tables of the German Federal Office for Agriculture and Food



**Legend/explanation of symbols in the tables:**

– nothing or less than one unit
. no information available until editorial deadline
0 less than half of 1 in the final digit shown, but more than nothing
/ no information, since the numeric value is not reliable enough
() Numeric value statistically relatively unreliable

## UFOP Information Service – Charts of the week

# Biofuels

## Tab. 1: Germany: Development of fuel consumption since 1990

| Year | Biodiesel[1] | Vegetable oil | Bioethanol | Total renewable fuel supply |
|---|---|---|---|---|
| | | | | Data in 1,000 tonnes |
| 1990 | 0 | 0 | 0 | **0** |
| 1995 | 35 | 5 | 0 | **40** |
| 2000 | 250 | 16 | 0 | **266** |
| 2001 | 350 | 20 | 0 | **370** |
| 2002 | 550 | 24 | 0 | **574** |
| 2003 | 800 | 28 | 0 | **828** |
| 2004 | 1,017 | 33 | 65 | **1,115** |
| 2005 | 1,800 | 196 | 238 | **2,234** |
| 2006 | 2,817 | 711 | 512 | **4,040** |
| 2007 | 3,318 | 838 | 460 | **4,616** |
| 2008 | 2,695 | 401 | 625 | **3,721** |
| 2009 | 2,431 | 100 | 892 | **3,423** |
| 2010 | 2,529 | 61 | 1,165 | **3,755** |
| 2011 | 2,426 | 20 | 1,233 | **3,679** |
| 2012 | 2,479 | 25 | 1,249 | **3,753** |
| 2013 | 2,213 | 1 | 1,208 | **3,422** |
| 2014 | 2,363 | 6 | 1,229 | **3,598** |
| 2015 | 2,149 | 2 | 1,173 | **3,324** |
| 2016 | 2,154 | 3 | 1,175 | **3,332** |
| 2017 | 2,216 | 0 | 1,156 | **3,372** |

Sources: BAFA, BLE
[1] as of 2012 incl. HVO

## Tab. 2: Germany: Domestic consumption of biofuels 2012 – 2017 in 1,000 t

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| Biodiesel admixture | 2,347.6 | 2,181.4 | 2,310.5 | 2,144.9 | 2,150.3 | 2,207.6 |
| Biodiesel pure fuel | 131.0 | 30.1 | 4.9 | 3.5 | . | . |
| **Total biodiesel** | **2,478.7** | **2,211.5** | **2,315.4** | **2,144.9** | **2,150.3** | **2,207.6** |
| | | | | | | |
| Vegetable oil | 24.7 | 1.2 | 5.5 | 2.0 | 3.6 | . |
| **Total biodiesel & veg oil** | **2,503.4** | **2,212.8** | **2,320.9** | **2,150.3** | **2,153.9** | **2,207.6** |
| | | | | | | |
| Diesel fuel | 33,678.0 | 34,840.4 | 35,587.1 | 36,756.4 | 35,751.0 | 36,439.6 |
| Share of admixture in % | 7.0 | 6.3 | 6.5 | 5.8 | 5.7 | 5.7 |
| **Total fuels** | **33,833.7** | **34,871.8** | **35,597.5** | **36,761.8** | **35,754.6** | **36,439.6** |
| Share of biodiesel & veg oil in % | 7.4 | 6.4 | 6.5 | 5.8 | 5.7 | . |
| | | | | | | |
| Bioethanol ETBE | 141.7 | 154.5 | 138.8 | 119.2 | 128.8 | 111.6 |
| Bioethanol admixture | 1,089.7 | 1,040.5 | 1,082.0 | 1,054.2 | 1,046.7 | 1,042.5 |
| Bioethanol E 85 | 21.3 | 13.6 | 10.2 | 6.7 | . | . |
| **Total bioethanol** | **1,252.7** | **1,208.6** | **1,231.0** | **1,180.1** | **1,175.4** | **1,154.0** |
| | | | | | | |
| Petroleum fuels | 17,251.5 | 18,422.3 | 18,526.6 | 17,057.0 | 17,062.3 | 17,373.3 |
| Petroleum + bioethanol fuels | 18,504.3 | 18,433.5 | 18,535.1 | 18,230.4 | 18,237.7 | 18,527.4 |
| Share of bioethanol in % | 6.8 | 6.6 | 6.6 | 6.9 | 6.4 | 6.2 |

Sources: German Federal Office of Economics and Export Control, AMI

## Tab. 3a: Germany: Monthly domestic consumption of biofuels 2012 – 2017 in 1,000 t

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| **Biodiesel admixture** | | | | | | |
| January | 161.02 | 146.27 | 167.03 | 159.92 | 174.56 | 150.49 |
| February | 172.99 | 156.15 | 172.77 | 173.73 | 167.74 | 134.44 |
| March | 220.94 | 183.56 | 176.93 | 188.86 | 194.59 | 206.30 |
| April | 194.71 | 156.84 | 198.67 | 190.02 | 191.14 | 175.29 |
| May | 210.06 | 191.17 | 216.23 | 204.96 | 184.26 | 178.24 |
| June | 209.83 | 189.65 | 187.11 | 191.21 | 203.36 | 189.90 |
| July | 220.32 | 189.72 | 207.78 | 190.25 | 194.50 | 205.67 |
| August | 223.92 | 210.23 | 211.41 | 185.33 | 186.81 | 206.88 |
| September | 213.08 | 192.94 | 189.59 | 165.14 | 172.73 | 200.31 |
| October | 173.56 | 193.40 | 190.92 | 159.41 | 159.06 | 189.54 |
| November | 178.68 | 187.05 | 200.01 | 167.24 | 160.88 | 193.45 |
| December | 168.52 | 184.43 | 192.06 | 168.83 | 160.68 | 173.96 |
| **Average** | **195.64** | **181.78** | **192.54** | **178.74** | **179.19** | **183.70** |
| **Total volume** | **2,347.62** | **2,181.41** | **2,310.48** | **2,144.90** | **2,150.29** | **2,204.46** |
| **Biodiesel pure fuel** | | | | | | |
| January | 5.26 | 7.19 | 0.17 | . | . | . |
| February | 4.77 | 3.01 | 0.23 | . | . | . |
| March | 4.93 | 9.24 | 0.15 | . | . | . |
| April | 19.98 | 1.40 | 0.20 | . | . | . |
| May | 13.79 | 2.37 | 0.25 | . | . | . |
| June | 5.04 | 0.60 | 0.45 | . | . | . |
| July | 9.10 | -1.58 | 0.40 | . | . | . |
| August | 12.77 | 1.51 | 0.49 | . | . | . |
| September | 18.80 | 1.43 | 1.29 | . | . | . |
| October | 9.49 | 2.41 | 0.41 | . | . | . |
| November | 8.64 | 2.27 | -0.43 | . | . | . |
| December | 18.47 | 0.29 | 1.28 | . | . | . |
| **Average** | **10.92** | **2.51** | **0.41** | . | . | . |
| **Total volume** | **131.03** | **30.13** | **4.89** | . | . | . |
| **Total biodiesel** | | | | | | |
| January | 166.28 | 153.46 | 167.20 | 159.92 | 174.56 | 150.49 |
| February | 177.76 | 159.16 | 173.00 | 173.73 | 167.74 | 134.44 |
| March | 225.87 | 192.80 | 177.07 | 188.86 | 194.59 | 206.30 |
| April | 214.69 | 158.24 | 198.88 | 190.02 | 191.14 | 175.29 |
| May | 223.85 | 193.54 | 216.48 | 204.96 | 184.26 | 178.24 |
| June | 214.86 | 190.25 | 187.56 | 191.21 | 203.36 | 189.90 |
| July | 229.42 | 188.15 | 208.18 | 190.25 | 194.50 | 205.67 |
| August | 236.69 | 211.74 | 211.90 | 185.33 | 186.81 | 206.88 |
| September | 231.88 | 194.37 | 190.87 | 165.14 | 172.73 | 200.31 |
| October | 183.06 | 195.81 | 191.33 | 159.41 | 159.06 | 189.54 |
| November | 187.32 | 189.32 | 199.58 | 167.24 | 160.88 | 193.45 |
| December | 186.99 | 184.71 | 193.33 | 168.83 | 160.68 | 173.96 |
| **Average** | **206.55** | **184.30** | **192.95** | **178.74** | **179.19** | **183.70** |
| **Total volume** | **2,478.65** | **2,211.55** | **2,315.38** | **2,144.90** | **2,150.29** | **2,204.46** |

continued on Page 30

## Tab. 3b: Germany: Monthly domestic consumption of biofuels 2012 – 2017 in 1,000 t

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017* |
|---|---|---|---|---|---|---|
| **Vegetable oil** | | | | | | |
| January | 0.23 | 0.07 | 0.06 | 0.03 | 0.09 | . |
| February | 2.91 | 0.02 | 0.12 | 0.01 | 0.00 | . |
| March | 1.79 | 0.06 | 0.12 | 0.11 | 2.55 | . |
| April | 1.86 | 0.10 | -0.18 | 0.11 | 0.00 | . |
| May | 1.04 | 0.14 | 0.12 | 0.08 | 0.84 | . |
| June | 1.09 | 0.08 | 2.04 | 0.06 | 0.10 | . |
| July | 7.34 | 0.12 | 0.15 | 0.09 | 0.09 | . |
| August | 5.44 | 0.13 | 0.19 | 0.13 | 0.13 | . |
| September | 1.45 | 0.14 | 2.43 | 1.09 | 0.10 | . |
| October | 0.74 | 0.17 | 0.20 | 0.15 | 0.00 | . |
| November | 0.28 | 0.12 | 0.16 | 0.10 | 0.04 | . |
| December | 0.55 | 0.07 | 0.11 | 0.02 | 0.00 | . |
| **Average** | **2.06** | **0.10** | **0.46** | **0.16** | **0.33** | **.** |
| **Total volume** | **24.71** | **1.21** | **5.53** | **1.97** | **3.94** | **.** |
| **Bioethanol** | | | | | | |
| January | 95.38 | 92.82 | 94.99 | 78.98 | 93.38 | 76.54 |
| February | 94.63 | 80.65 | 83.84 | 85.04 | 80.02 | 69.40 |
| March | 107.54 | 99.73 | 86.36 | 90.78 | 89.75 | 79.78 |
| April | 110.89 | 98.98 | 107.83 | 98.76 | 90.30 | 89.19 |
| May | 112.74 | 108.11 | 114.48 | 108.24 | 98.41 | 93.38 |
| June | 106.79 | 110.36 | 96.42 | 100.65 | 107.85 | 88.24 |
| July | 107.92 | 111.92 | 110.17 | 107.01 | 112.06 | 97.21 |
| August | 104.14 | 103.73 | 117.60 | 109.16 | 103.16 | 93.69 |
| September | 100.87 | 101.06 | 99.66 | 99.39 | 96.38 | 86.33 |
| October | 114.03 | 108.73 | 98.00 | 99.15 | 101.30 | 92.56 |
| November | 105.81 | 97.95 | 98.20 | 94.53 | 99.65 | 82.98 |
| December | 91.99 | 94.54 | 121.75 | 101.78 | 103.20 | 92.98 |
| **Average** | **104.39** | **100.72** | **102.44** | **97.79** | **97.95** | **86.86** |
| **Total volume** | **1,252.73** | **1,208.58** | **1,229.29** | **1,173.48** | **1,175.45** | **1,042.28** |

Note: Data for 2017 provisional
Sources: German Federal Office of Economics and Export Control, AMI
*Data not possible due to missing state approval by the EU-COM

## Tab. 4: Germany: Foreign trade with biodiesel 2012 – 2017 in t

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| **Biodiesel import** | | | | | | |
| January | 28,314 | 24,087 | 17,431 | 43,895 | 48,778 | 43,907 |
| February | 24,575 | 18,575 | 19,251 | 27,362 | 61,228 | 45,230 |
| March | 37,962 | 26,276 | 31,719 | 32,016 | 78,121 | 58,138 |
| April | 57,864 | 50,057 | 43,874 | 50,178 | 105,341 | 67,101 |
| May | 98,630 | 62,615 | 49,384 | 54,036 | 66,151 | 68,884 |
| June | 107,837 | 60,834 | 56,013 | 58,882 | 61,900 | 57,016 |
| July | 83,011 | 78,428 | 81,779 | 57,543 | 75,016 | 80,864 |
| August | 92,707 | 73,279 | 74,013 | 48,774 | 60,430 | 80,470 |
| September | 73,889 | 49,625 | 58,514 | 38,477 | 74,432 | 75,268 |
| October | 78,031 | 40,602 | 40,080 | 28,194 | 50,255 | 82,310 |
| November | 34,383 | 42,430 | 52,172 | 35,382 | 40,634 | 70,249 |
| December | 44,436 | 31,739 | 59,741 | 46,227 | 34,432 | 61,948 |
| **Total** | **761,639** | **558,547** | **583,971** | **520,966** | **756,718** | **791,385** |
| **Biodiesel export** | | | | | | |
| January | 74,819 | 116,281 | 150,584 | 139,211 | 86,117 | 105,416 |
| February | 70,808 | 80,558 | 128,300 | 100,652 | 105,758 | 121,281 |
| March | 89,012 | 134,784 | 143,441 | 89,716 | 103,756 | 101,720 |
| April | 83,517 | 92,598 | 112,717 | 134,857 | 102,930 | 152,216 |
| May | 92,820 | 116,369 | 105,689 | 127,422 | 138,783 | 137,678 |
| June | 107,396 | 122,473 | 157,471 | 120,061 | 121,659 | 148,794 |
| July | 102,486 | 152,273 | 145,959 | 137,746 | 135,786 | 114,457 |
| August | 115,680 | 185,278 | 162,281 | 116,957 | 130,780 | 127,866 |
| September | 131,896 | 159,922 | 169,149 | 134,234 | 118,485 | 155,528 |
| October | 124,902 | 144,816 | 164,607 | 141,909 | 178,806 | 159,768 |
| November | 93,297 | 158,488 | 163,970 | 124,179 | 180,360 | 117,951 |
| December | 126,942 | 135,309 | 109,276 | 124,995 | 139,180 | 156,305 |
| **Total** | **1,213,575** | **1,599,149** | **1,713,444** | **1,491,939** | **1,542,400** | **1,598,980** |

Note: Data for 2017 provisional
Sources: German Federal Office of Economics and Export Control, AMI

## Tab. 5: Germany: Export of biodiesel [FAME] in t (2012 – 2017)

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| Belgium | 110,880 | 60,938 | 109,465 | 106,681 | 76,114 | 79,882 |
| Bulgaria | 12,811 | 6,101 | 339 | 980 | - | - |
| Denmark | 26,322 | 15,429 | 28,333 | 39,911 | 43,271 | 88,317 |
| Estonia | 5 | 0 | - | - | - | 24 |
| Finland | 8,496 | 688 | 8,729 | 855 | 7,603 | 8,068 |
| France | 35,392 | 86,369 | 221,605 | 182,278 | 84,972 | 76,323 |
| Greece | 1 | 387 | 806 | 22 | - | - |
| United Kingdom | 24,311 | 92,994 | 68,233 | 29,543 | 12,553 | 39,956 |
| Ireland | 3,001 | 18 | 14 | 2,225 | 886 | - |
| Italy | 63,362 | 58,271 | 77,291 | 32,165 | 9,488 | 10,770 |
| Croatia | 0 | 0 | - | - | - | - |
| Lithuania | 131 | 5,704 | 50 | 762 | 403 | 1,187 |
| Luxembourg | 4,026 | 12 | - | 0 | - | 0 |
| Malta | 1,240 | - | - | - | - | - |
| Netherlands | 269,114 | 453,694 | 545,156 | 372,586 | 523,772 | 553,861 |
| Austria | 170,308 | 144,675 | 107,063 | 132,774 | 70,762 | 96,355 |
| Poland | 197,625 | 172,576 | 137,243 | 125,443 | 229,507 | 236,249 |
| Portugal | 0 | 0 | 0 | 0 | - | 9 |
| Romania | 13,577 | 3,954 | 1,925 | 0 | 11,911 | 0 |
| Sweden | 26,056 | 6,964 | 55,829 | 111,094 | 60,133 | 73,089 |
| Slovakia | 4,871 | 3,180 | 10,376 | 155 | 939 | 6,596 |
| Slovenia | 6,456 | 1,410 | 174 | 1,530 | 164 | 1,651 |
| Spain | 274 | 15,146 | 49,312 | 7,799 | 30,865 | 33,388 |
| Czech Republic | 93,886 | 34,649 | 60,411 | 119,323 | 98,430 | 88,208 |
| Hungary | 6 | 55,466 | 25,627 | 7,654 | 31 | 3,409 |
| Cyprus | 14,899 | 13,540 | 15,796 | 81 | - | - |
| **EU-28*** | **1,087,049** | **1,232,164** | **1,523,776** | **1,273,862** | **1,261,805** | **1,397,341** |
| USA | 405 | 180,200 | 8,485 | 10,857 | 84,933 | 70,053 |
| Other countries | 3,274 | 34,207 | 89,009 | 130,396 | 111,472 | 100,061 |
| **Total** | **1,090,728** | **1,446,571** | **1,621,270** | **1,415,115** | **1,458,210** | **1,567,455** |

Note: Data for 2017 provisional
Sources: Federal Statistics Office of Germany, AMI
* Volumes of other EU countries not relevant for collection

## Tab. 6: Germany: Import of biodiesel [FAME] in t (2012–2017)

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| France | 191,117 | 127,403 | 46,651 | 80,366 | 101,252 | 136,199 |
| Netherlands | - | - | - | - | 3,664 | 20,388 |
| Italy | 1,051 | 1 | - | 29 | 7 | 1,102 |
| United Kingdom | 5,669 | 574 | 7,741 | 22,401 | 8,733 | 14,210 |
| Denmark | 20,446 | 3,470 | 1,845 | 862 | 877 | 607 |
| Spain | 727 | 2 | 20,643 | 15,776 | - | 2,730 |
| Sweden | 385,439 | 321,278 | 257,853 | 127,116 | 283,145 | 293,956 |
| Austria | 30,194 | 25,751 | 38,336 | 51,133 | 85,898 | 91,812 |
| Belgium | 54,337 | 47,683 | 34,471 | 63,715 | 87,420 | 70,458 |
| Latvia | 58 | 38 | 0 | 277 | 168 | 140 |
| Poland | 276 | - | 682 | 123 | 15,604 | 6,549 |
| Czech Republic | - | 156 | - | 76 | 1,190 | 1,929 |
| Slovakia | - | - | - | - | 10 | - |
| Hungary | 173 | 2,253 | 4,978 | 3,742 | 12,184 | 2,460 |
| Bulgaria | - | - | - | - | 50 | 193 |
| Slovenia | - | - | 75 | - | - | - |
| Cyprus | 689,485 | 528,608 | 413,276 | 365,614 | 600,203 | 642,734 |
| **EU-28*** | **16,572** | **880** | **100,348** | **132,041** | **129,042** | **124,458** |
| Malaysia | - | 7,585 | 6,121 | 2,412 | 5,822 | 3,309 |
| Indonesia | - | - | - | - | 666 | 2,949 |
| USA | 23,712 | 44 | 824 | 658 | 1,788 | 2,967 |
| Other countries | 729,769 | 537,117 | 520,569 | 500,725 | 737,521 | 776,417 |
| **Total** | | **729,769** | **537,117** | **520,569** | **500,725** | **698,890** |

Note: Data for 2017 provisional
Sources: Federal Statistics Office of Germany, AMI
* Volumes of other EU countries not relevant for collection

## Tab. 7: Biodiesel production capacities 2017 in Germany

| Operator / Plant | Location | Capacity (t/year) |
|---|---|---|
| ADM Hamburg AG – Hamburg plant | Hamburg | not available |
| ADM Mainz GmbH | Mainz | not available |
| Bioeton Kyritz GmbH | Kyritz | 80,000 |
| BIO-Diesel Wittenberge GmbH | Wittenberge | 120,000 |
| BIOPETROL ROSTOCK GmbH | Rostock | 200,000 |
| Biowerk Sohland GmbH | Sohland | 80,000 |
| Bunge Deutschland GmbH | Mannheim | 100,000 |
| Cargill GmbH | Frankfurt/Main | 300,000 |
| ecoMotion GmbH | Sternberg | 100,000 |
| ecoMotion GmbH | Lünen | 162,000 |
| ecoMotion GmbH | Malchin | 10,000 |
| german biofuels gmbh | Falkenhagen | 130,000 |
| Glencore Magdeburg GmbH | Magdeburg | 64,000 |
| Gulf Biodiesel Halle GmbH | Halle | 56,000 |
| KFS Biodiesel GmbH | Cloppenburg | 50,000 |
| KFS Biodiesel GmbH | Niederkassel-Lülsdorf | 120,000 |
| KFS Biodiesel GmbH | Kassel/Kaufungen | 50,000 |
| Louis Dreyfus commodities Wittenberg GmbH | Lutherstadt Wittenberg | 200,000 |
| Mercuria Biofuels Brunsbüttel GmbH | Brunsbüttel | 250,000 |
| NEW Natural Energie West GmbH | Neuss | 260,000 |
| Rapsol GmbH | Lübz | 6,000 |
| REG Germany AG | Borken | 85,000 |
| REG Germany AG | Emden | 100,000 |
| TECOSOL GmbH | Ochsenfurt | 75,000 |
| Verbio Diesel Bitterfeld GmbH & Co. KG (MUW) | Greppin | 190,000 |
| Verbio Diesel Schwedt GmbH & Co. KG (NUW) | Schwedt | 250,000 |
| **Total (without ADM)** | | **3,038,000** |

Note: AGQM member;
Sources: UFOP, FNR, VDB, AGQM/Some names abreviated
DBV and UFOP recommend the biodiesel reference from the circle of members of the working group
Status: July 2018

## Tab. 8: EU production of biodiesel and HVO 2010 – 2017 in 1,000 t

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| Belgium | 349 | 311 | 314 | 305 | 454 | 252 | 239 | 250 |
| Denmark | 76 | 79 | 109 | 200 | 200 | 140 | 140 | 90 |
| Germany | 2,800 | 2,800 | 2,600 | 2,600 | 3,000 | 3,100 | 3,200 | 3,100 |
| United Kingdom | 156 | 180 | 250 | 268 | 143 | 149 | 344 | 375 |
| France | 1,967 | 1,789 | 2,146 | 2,109 | 2,028 | 2,047 | 1,884 | 1,710 |
| Italy | 799 | 591 | 287 | 459 | 580 | 577 | 350 | 400 |
| Netherlands | 382 | 204 | 332 | 606 | 734 | 650 | 636 | 500 |
| Austria | 337 | 310 | 265 | 217 | 292 | 340 | 307 | 310 |
| Poland | 371 | 364 | 592 | 648 | 692 | 759 | 871 | 900 |
| Portugal | 308 | 355 | 296 | 297 | 326 | 349 | 325 | 270 |
| Sweden | 135 | 136 | 111 | 125 | 126 | 92 | 82 | 60 |
| Slovenia | 21 | 1 | 6 | 15 | 0 | 0 | 0 | 0 |
| Slovakia | 124 | 125 | 110 | 105 | 103 | 125 | 110 | 109 |
| Spain | 841 | 649 | 472 | 581 | 894 | 971 | 1,160 | 1,515 |
| Czech Republic | 198 | 210 | 173 | 182 | 219 | 168 | 149 | 150 |
| **EU others** | **485** | **557** | **669** | **724** | **722** | **754** | **811** | **652** |
| **EU-27** | **9,349** | **8,661** | **8,732** | **9,441** | **10,513** | **10,473** | **10,608** | **10,391** |
| **HVO[1]** | **319** | **580** | **1,258** | **1,326** | **2,009** | **2,370** | **2,411** | **2,666** |
| **Total** | **9,668** | **9,241** | **9,990** | **10,767** | **12,522** | **12,843** | **13,019** | **13,057** |

Source: F.O. Licht
[1] Cumulative estimate (Sp, Fin, Fr, It)

## Tab. 9: EU production capacities for biodiesel 2010 – 2014 and 2017 in 1,000 t

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2017 |
|---|---|---|---|---|---|---|
| Germany | 4,933 | 4,932 | 4,968 | 4,970 | 3,038 | 3,038[1] |
| France* | 2,505 | 2,505 | 2,456 | 2,480 | 2,480 | 2,080 |
| Italy* | 2,375 | 2,265 | 2,310 | 2,340 | 2,340 | 1,525 |
| Netherlands* | 1,328 | 1,452 | 2,517 | 2,250 | 2,495 | 2,505 |
| Belgium | 670 | 710 | 770 | 959 | 959 | 846 |
| Luxembourg | . | . | 20 | . | . | 0 |
| United Kingdom | 609 | 404 | 574 | 577 | 577 | 528 |
| Ireland* | 76 | 76 | 76 | 76 | 76 | 74 |
| Denmark | 250 | 250 | 250 | 250 | 250 | 250 |
| Greece | 662 | 802 | 812 | . | 762 | 729 |
| Spain | 4,100 | 4,410 | 5,300 | 4,320 | 3,900 | 3,398 |
| Portugal | 468 | 468 | 483 | 470 | 470 | 639 |
| Austria | 560 | 560 | 535 | 500 | 500 | 524 |
| Finland* | 340 | 340 | 340 | 340 | 340 | 430 |
| Sweden | 277 | 277 | 270 | 270 | 270 | 362 |
| Estonia | 135 | 135 | 110 | . | . | . |
| Latvia | 156 | 156 | 156 | . | . | 154 |
| Lithuania | 147 | 147 | 130 | . | . | 147 |
| Malta | 5 | 5 | 5 | . | . | 5 |
| Poland | 710 | 864 | 884 | 900 | 1,184 | 1,239 |
| Slovakia | 156 | 156 | 156 | 156 | 156 | 166 |
| Slovenia | 105 | 113 | 113 | 125 | 125 | 100 |
| Czech Republic | 427 | 427 | 437 | 410 | 410 | 464 |
| Hungary | 158 | 158 | 158 | . | . | 188 |
| Cyprus | 20 | 20 | 20 | . | . | 20 |
| Bulgaria | 425 | 348 | 408 | . | . | 356 |
| Romania | 307 | 277 | 277 | . | . | 295 |
| **EU-27[2]** | **21,904** | **22,257** | **24,535** | **21,393** | **20,332** | **21,199** |

Note: The share of capacities that are now disused is not measurable for every member state.
* = incl. production capacities for hydrogenated vegetable oil (HVO)/co-refining

Sources: European Biodiesel Board (Statistics not continued as of 2014), national statistics
1) without ADM
2) Volumes of other EU countries not relevant for collection

## Tab. 10: Global biodiesel and HVO production 2010–2017 (in 1,000 t)

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| **Biodiesel production** | | | | | | | | |
| EU-27 | 9,349.00 | 8,661.00 | 8,732.00 | 9,441.00 | 10,513.00 | 10,473.00 | 10,608.00 | 10,391.00 |
| Canada | 101.00 | 106.00 | 88.00 | 154.00 | 300.00 | 260.00 | 352.00 | 350.00 |
| USA | 1,131.90 | 3,191.10 | 3,270.30 | 4,423.30 | 4,184.40 | 4,174.50 | 5,174.40 | 5,266.80 |
| Argentina | 1,814.80 | 2,425.30 | 2,455.30 | 1,997.80 | 2,584.30 | 1,810.70 | 2,659.30 | 2,871.40 |
| Brazil | 2,100.00 | 2,352.00 | 2,391.40 | 2,567.40 | 3,009.50 | 3,464.80 | 3,345.20 | 3,776.30 |
| Colombia | 337.70 | 454.40 | 490.10 | 503.30 | 518.50 | 513.40 | 447.80 | 459.80 |
| Peru | 8.00 | 14.00 | 16.00 | 16.00 | 2.00 | 1.00 | 0.00 | 50.00 |
| India | 15.00 | 5.00 | 5.00 | 60.00 | 40.00 | 30.00 | 25.00 | 20.00 |
| Indonesia | 800.00 | 1,250.00 | 1,550.00 | 1,950.00 | 3,486.80 | 1,454.50 | 2,500.00 | 2,600.00 |
| Malaysia | 112.00 | 50.00 | 238.00 | 446.00 | 414.00 | 680.00 | 618.00 | 720.00 |
| Philippines | 109.00 | 117.00 | 121.00 | 136.00 | 151.00 | 180.00 | 199.00 | 185.00 |
| Singapore | - | - | - | - | - | - | - | - |
| Thailand | 523.90 | 555.50 | 788.70 | 923.60 | 1,032.00 | 1,089.00 | 1,084.20 | 1,256.30 |
| Rest of the world | 714.00 | 822.00 | 967.00 | 1,098.00 | 1,130.00 | 1,312.00 | 1,396.00 | 1,411.00 |
| TOTAL | 17,116.40 | 20,003.40 | 21,112.70 | 23,716.40 | 27,365.40 | 25,442.80 | 28,408.80 | 29,357.70 |

| **HVO production*** | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| EU-27 | 319.00 | 580.00 | 1,258.00 | 1,326.00 | 2,009.00 | 2,370.00 | 2,411.00 | 2,666.00 |
| USA | 11.00 | 186.00 | 150.00 | 480.00 | 1,075.00 | 875.00 | 1,050.00 | 1,300.00 |
| Singapore | 40.00 | 194.00 | 750.00 | 811.00 | 871.00 | 942.00 | 1,000.00 | 980.00 |
| Thailand | 0.00 | 0.00 | 0.00 | 10.00 | 15.00 | 15.00 | 15.00 | 15.00 |
| TOTAL | 370.00 | 960.00 | 2,158.00 | 2,627.00 | 3,970.00 | 4,202.00 | 4,476.00 | 4,961.00 |
| **Sum total Biodiesel/HVO production worldwide** | **17,486.40** | **20,963.40** | **23,270.70** | **26,343.40** | **31,335.40** | **29,644.80** | **32,884.80** | **34,318.70** |

* HVO = Hydrogenated Vegetable Oil
Source: F.O. Licht

## Tab. 11: Global biodiesel and HVO consumption 2010–2017 (in 1,000 t)

| Biodiesel production | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| EU-27 | 11,631.00 | 11,484.00 | 11,440.00 | 10,596.00 | 11,504.00 | 10,518.00 | 10,490.00 | 10,830.00 |
| Canada | 108.00 | 221.00 | 257.00 | 335.00 | 335.00 | 470.00 | 387.00 | 426.00 |
| USA | 867.90 | 2,923.80 | 2,953.50 | 4,629.90 | 4,629.90 | 4,930.20 | 6,798.00 | 6,448.20 |
| Argentina | 508.60 | 748.70 | 874.80 | 885.00 | 970.10 | 1,013.90 | 1,033.00 | 1,173.30 |
| Brazil | 2,040.60 | 2,259.60 | 2,304.40 | 2,589.90 | 3,001.00 | 3,524.20 | 3,343.60 | 3,374.00 |
| Colombia | 296.00 | 450.00 | 488.20 | 505.70 | 518.70 | 523.40 | 506.00 | 513.30 |
| Peru | 85.70 | 238.80 | 251.00 | 261.20 | 257.20 | 277.80 | 293.60 | 290.40 |
| India | - | - | - | - | - | - | - | 20.00 |
| Indonesia | 196.00 | 315.00 | 589.00 | 922.00 | 1,565.20 | 805.60 | 2,647.00 | 2,517.00 |
| Malaysia | 6.00 | 15.00 | 110.00 | 165.00 | 172.00 | 255.00 | 278.00 | 299.00 |
| Philippines | 110.00 | 108.00 | 121.00 | 135.00 | 143.00 | 150.00 | 192.00 | 200.00 |
| Thailand | 553.60 | 559.40 | 801.90 | 897.80 | 1,074.80 | 1,134.90 | 1,025.30 | 1,254.50 |
| Rest of the world | 796.00 | 803.00 | 941.00 | 1,416.00 | 3,431.00 | 1,460.00 | 1,580.00 | 1,498.00 |
| TOTAL | 17,199.30 | 20,126.30 | 21,131.80 | 23,338.50 | 27,602.00 | 25,063.00 | 28,573.80 | 28,843.60 |

| HVO consumption* | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| EU-27 | 222.00 | 563.00 | 1,442.00 | 1,128.00 | 1,757.00 | 2,115.00 | 2,008.00 | 2,371.00 |
| USA | - | 15.00 | 139.00 | 149.00 | 154.00 | 77.00 | 63.00 | 67.00 |
| Singapore | 32.00 | 186.00 | 293.40 | 1,093.10 | 1,437.00 | 1,514.90 | 1,745.30 | 1,952.40 |
| Thailand | - | - | - | 10.00 | 15.00 | 15.00 | 15.00 | 15.00 |
| Rest of the world | 38.00 | 83.00 | 101.00 | 43.00 | 184.00 | 123.00 | 225.00 | 435.00 |
| TOTAL | 292.00 | 847.00 | 1,975.40 | 2,423.10 | 3,547.90 | 3,844.90 | 4,056.30 | 4,840.40 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sum total biodiesel/ HVO consumption worldwide** | **17,491.30** | **20,973.30** | **23,107.20** | **25,761.60** | **31,149.90** | **28,907.90** | **32,630.10** | **33,684.00** |

* HVO = Hydrogenated Vegetable Oil
Source: F.O. Licht

# Biofuel mandates

## Tab. 12: Biofuel mandates from 13 selected EU member states

**In 2018, applicable biofuel mandates are in bold**

### a) Bulgaria

| | Biodiesel (% vol) | Bioethanol (% vol) | | Double counting |
|---|---|---|---|---|
| **Since 1st June 2012** | **6** | **1st January 2018** | **8** | **No** |
| | | 1st January 2019 | 9 | |
| | | 1st January 2020 | 10 | |

### b) Denmark

| | Total share (% cal) | 2nd gen. biofuels (% cal) | Biodiesel (% cal) | Bioethanol (% cal) | Double counting |
|---|---|---|---|---|---|
| **Since 2012** | **5.75** | | | | |
| 2020 | 5.75 | 0.9 | | | |

### c) Germany

| | % GHG (greenhouse gas savings (BImSchG)* | Upper limit for biofuels recovered from agricultural raw materials (% cal) | 2nd generation biofuels (% cal) | Double counting |
|---|---|---|---|---|
| **2018–2019** | **4.0** | **6.5** | | **No** |
| 2020 | 6.0 | | 0.05* | |
| 2021 | | | 0.1* | |
| 2022–2023 | | | 0.2* | |
| 2025 and onwards | | | 0.5 | |

Penalty fee for the lapse in mandatory admixture: 0.47 EUR per kg of $CO_2$ emissions below the savings target

* Companies that put on the market 20 PJ (for 2020); 10 PJ (for 2021); 2 PJ (for 2022 – 2023) or less of biofuels in the previous year are exempted.

### d) Finland

| | Share of biofuels (% cal) |
|---|---|
| **2018** | **15** |
| 2019 | 18 |
| 2020 and onwards | 20 |

Explanations: % cal = Percentage share of energy content; % vol = volume content

**Source and further information: GAIN Report** "Biofuel Mandates in the EU by Member State in 2018" (No. GM18024, published 19.06.2018 in English), see also https://gain.fas.usda.gov.

## Tab. 12: Biofuel mandates from 13 selected EU member states – continued
### In 2018, applicable biofuel mandates are in bold

### e) France

| | Bioethanol (target, % cal) | Biodiesel (target, % cal) | Double counting |
|---|---|---|---|
| 2010 to 2013 | 7 | 7 | No |
| 2014 to 2016 | 7<br>of which up to 0.25 %<br>double-counted bioethanol | 7.7<br>of which up to 0.35 %<br>double-counted biodiesel | **for biofuels made from cellulose and biofuels made from (vegetable and organic) waste up to the highest values stated on the left hand side** |
| **Since 2017** | **7.5<br>of which up to 0.3 %<br>double-counted bioethanol** | **7.7<br>of which up to 0.35 %<br>double-counted biodiesel** | |

### f) Ireland

| | Total share (% cal) | Double counting |
|---|---|---|
| **2017 – 2018** | **8.7** | **Yes, UCO and Cat 1 Tallow** |
| 2019 and onwards | 11.1 (10 % by vol. is proposed) | |

### g) Italy

| | Total biofuels (% cal) | of which 2nd generation bio-fuels (% cal, double.counted) | 2nd generation biofuels required for meeting the targets (% cal) |
|---|---|---|---|
| **2018** | 7 | **0.1** | **0.6** |
| 2019 | 8 | 0.2 | 0.6 |
| 2020 | 9 | 1.0 | 0.8 |
| 2021 | 10 | 1.6 | 0.8 |
| 2022 | 10 | 2 | 1 |

### h) Austria

| | Total share (% cal) | Biodiesel (% cal) | Bioethanol (% cal) | Double counting |
|---|---|---|---|---|
| **Since 2012** | **5.8** | **6.3** | **3.4** | **Yes** |
| 2020 | 8.8 | | | |

### i) Poland

| | Total share (% cal) | Biodiesel (% cal) | Bioethanol (% cal) | Double counting |
|---|---|---|---|---|
| **2018** | **7.5** | | | **Yes** |
| 2019 | 8.0 | | | |
| 2020 | 8.5 | | | |

Explanations: % cal = Percentage share of energy content; % vol = volume content

**Source and further information:** **GAIN Report** "Biofuel Mandates in the EU by Member State in 2018" (No. GM18024, published 19.06.2018 in English), see also https://gain.fas.usda.gov.

## Tab. 12: Biofuel mandates from 13 selected EU member states – continued

**In 2018, applicable biofuel mandates are in bold**

### j) Slovakia

| | Total share (% cal) | 2nd generation biofuels (% cal) | Double counting |
|---|---|---|---|
| **2018** | **5.8** | | |
| 2019 | 6.9 | 0.1 | |
| 2020 | 7.6 | | **Yes** |
| 2021 | 8.0 | 0.5 | |
| 2022–2024 | 8.2 | | |
| 2025–2030 | | 0.8 | |

### k) Spain

| | Total share (% cal) | Biodiesel (% cal) | Bioethanol (% cal) | Double counting |
|---|---|---|---|---|
| 2013–2015 | 4.1 | 4.1 | 3.9 | |
| 2016 | 4.3 | - | - | |
| 2017 | 5 | - | - | |
| **2018** | **6** | **-** | **-** | **n/a** |
| 2019 | 7 | - | - | |
| 2020 | 8.5 | - | - | |

### l) Czech Republic

| | Share of biofuels and renewable electricity in transport in the overall consumption (% cal) | Obligation to reduce the overall green-house gas emissions by (%) | Biodiesel (% vol) | Bio-ethanol (% vol) | Double counting |
|---|---|---|---|---|---|
| **2017 – 2019** | **3.5** | | **6** | **4.1** | **No** |
| 2020 | 10 | 6 | | | |

### m) United Kingdom

| | Total share (% cal) | Development fuel target (% cal) | Double counting |
|---|---|---|---|
| **up to 31.12.18** | **7.8** | **–** | |
| 2019 | 9.2 | 0.1 | |
| 2020 | 10.6 | 0.2 | **for particular waste or residual materials defined by the system administrator; plus energy crops and renewable fuels of a non-biological origin (including development fuels)** |
| 2021 | 10.7 | 0.6 | |
| 2022 | 10.7 | 0.9 | |
| 2023–2031 | Every year increasing by 0.025 percent, increases by volume up to: | Every year increasing by 0.23 percent, increases by volume up to: | |
| 2032 | 11 | 3.2 | |

Explanations: % cal = Percentage share of energy content; % vol = volume content

**Source and further information:** **GAIN Report** "Biofuel Mandates in the EU by Member State in 2018" (No. GM18024, published 19.06.2018 in English), see also https://gain.fas.usda.gov.

# Tables of the German Federal Office for Agriculture and Food

## Tab. 13: Germany: Feedstocks of the biofuels in Terajoules [TJ][1]

| Fuel type | Bioethanol | | | Biomethane | | | Biomethanol[2] |
|---|---|---|---|---|---|---|---|
| Quota year | 2014 | 2015 | 2016 | 2014 | 2015 | 2016 | 2015 |
| Feedstock | | | | | | | |
| Waste/residual material | 791 | 156 | 118 | 1,596 | 1,251 | 1,373 | 0.04 |
| Barley | 1,082 | 1,353 | 1,435 | . | . | . | . |
| Maize | 9,576 | 10,313 | 9,983 | 33 | . | . | . |
| Palm oil | . | . | . | . | . | . | . |
| Rapeseed | . | . | . | . | . | . | . |
| Rye | 3,231 | 2,292 | 2,028 | . | . | . | . |
| Soya | . | . | . | . | . | . | . |
| Sunflowers | . | . | . | . | . | . | . |
| Triticale | 1,094 | 2,717 | 2,341 | . | . | . | . |
| Wheat | 9,012 | 9,395 | 9,641 | . | . | . | . |
| Sugar cane | 627 | 650 | 2466 | . | . | . | . |
| Sugar beets | 6,987 | 4,177 | 2,176 | . | . | . | . |
| **Total** | **32,400** | **31,053** | **30,195** | **1,630** | **1,251** | **1,373** | **0.04** |

Source: BLE
[1] Discrepancies in totals are due to rounding
[2] no data in 2014 and 2016

## Tab. 14: Germany: Feedstocks of the biofuels in 1,000 tonnes [kt][1,2]

| Fuel type | Bioethanol | | | Biomethane | | | Biomethanol[3] |
|---|---|---|---|---|---|---|---|
| Quota year | 2014 | 2015 | 2016 | 2014 | 2015 | 2016 | 2015 |
| Feedstock | | | | | | | |
| Waste/residual material | 30 | 6 | 4 | 32 | 25 | 27 | 0.002 |
| Barley | 41 | 51 | 54 | . | . | . | . |
| Maize | 362 | 390 | 377 | 1 | . | . | . |
| Palm oil | . | . | , | . | . | . | . |
| Rapeseed | . | . | , | . | . | . | . |
| Rye | 122 | 87 | 77 | . | . | . | . |
| Soya | . | . | , | . | . | . | . |
| Sunflowers | . | . | , | . | . | . | . |
| Triticale | 41 | 103 | 88 | . | . | . | . |
| Wheat | 341 | 355 | 365 | . | . | . | . |
| Sugar cane | 24 | 25 | 93 | . | . | . | . |
| Sugar beets | 264 | 158 | 82 | . | . | . | . |
| **Total** | **1,224** | **1,173** | **1,141** | **33** | **25** | **27** | **0** |

Source: BLE
[1] Discrepancies in totals are due to rounding
[2] the conversion to tonnage was made based on the verifications, which were counted towards the quota
[3] no data in 2014 and 2016

| FAME | | | HVO | | | Vegetable oil | | |
|---|---|---|---|---|---|---|---|---|
| 2014 | 2015 | 2016 | 2014 | 2015 | 2016 | 2014 | 2015 | 2016 |
| 19,311 | 20,549 | 32,422 | . | 227 | 269 | . | . | . |
| . | . | . | . | . | . | . | . | . |
| . | . | ,. | . | . | . | . | . | . |
| 3,276 | 4,776 | 9,816 | 14,646 | 7,132 | 6,928 | . | . | . |
| 52,339 | 48,251 | 32,154 | 7 | . | . | 151 | 343 | 246 |
| . | . | . | . | . | . | . | . | . |
| 824 | 164 | 46 | . | . | . | . | . | . |
| . | 139 | 79 | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . |
| **75,750** | **73,878** | **74,517** | **14,653** | **7,359** | **7,197** | **151** | **343** | **246** |

| FAME | | | HVO | | | Vegetable oil | | |
|---|---|---|---|---|---|---|---|---|
| 2014 | 2015 | 2016 | 2014 | 2015 | 2016 | 2014 | 2015 | 2016 |
| 517 | 550 | 868 | . | 5 | 6 | . | . | . |
| . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . |
| 88 | 128 | 263 | 336 | 164 | 159 | . | . | . |
| 1,400 | 1,291 | 860 | 0.2 | . | . | 4 | 9 | . |
| . | . | . | . | . | . | . | . | . |
| 22 | 4 | 1 | . | . | . | . | . | . |
| . | 4 | 2 | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . |
| **2,027** | **1,977** | **1,994** | **336** | **169** | **165** | **4** | **9** | **7** |

## Tab. 15: Germany: Feedstocks of the biofuels according to origin in Terajoules [TJ][1]

| Region | Africa | | | Asia | | | Australia | | |
|---|---|---|---|---|---|---|---|---|---|
| Quota year | 2014 | 2015 | 2016 | 2014 | 2015 | 2016 | 2014 | 2015 | 2016 |
| Feedstock | | | | | | | | | |
| Waste/residual material | 75 | 191 | 252 | 2,403 | 2,755 | 6,641 | 16 | 36 | 47 |
| Barley | . | . | . | . | . | . | . | . | . |
| Maize | . | . | . | . | . | . | . | . | . |
| Palm oil | . | . | . | 17,916 | 11,907 | 16,435 | . | 1 | . |
| Rapeseed | . | . | . | 255 | 47 | . | 1,865 | 448 | 341 |
| Rye | . | . | . | . | . | . | . | . | . |
| Soya | . | . | . | . | . | . | 48 | . | . |
| Sunflowers | . | . | . | . | . | . | . | . | . |
| Triticale | . | . | . | . | . | . | . | . | . |
| Wheat | . | . | . | . | . | . | . | . | . |
| Sugar cane | . | 74 | . | . | . | . | . | . | . |
| Sugar beets | . | . | . | . | . | . | . | . | . |
| **Total** | **75** | **265** | **252** | **20,574** | **14,709** | **23,075** | **1,929** | **485** | **338** |

Source: BLE
[1] Discrepancies in totals are due to rounding

## Tab. 16: Germany: Feedstocks of the biofuels according to origin in 1,000 tonnes [kt][1,2]

| Region | Africa | | | Asia | | | Australia | | |
|---|---|---|---|---|---|---|---|---|---|
| Quota year | 2014 | 2015 | 2016 | 2014 | 2015 | 2016 | 2014 | 2015 | 2016 |
| Feedstock | | | | | | | | | |
| Waste/residual material | 2 | 5 | 7 | 64 | 73 | 177 | 0.4 | 1 | 1 |
| Barley | . | . | . | . | . | . | . | . | . |
| Maize | . | . | . | . | . | . | . | . | . |
| Palm oil | . | . | . | 423 | 291 | 413 | . | 0.03 | . |
| Rapeseed | . | . | . | 7 | 1 | . | 50 | 12 | 9 |
| Rye | . | . | . | . | . | . | . | . | . |
| Soya | . | . | . | . | . | . | 1 | . | . |
| Sunflowers | . | . | . | . | . | . | . | . | . |
| Triticale | . | . | . | . | . | . | . | . | . |
| Wheat | . | . | . | . | . | . | . | . | . |
| Sugar cane | . | 3 | . | . | . | . | . | . | . |
| Sugar beets | . | . | . | . | . | . | . | . | . |
| **Total** | **2** | **8** | **7** | **494** | **366** | **590** | **51** | **13** | **10** |

Source: BLE
[1] Discrepancies in totals are due to rounding
[2] the conversion to tonnage was made based on the verifications, which were counted towards the quota

| Europe | | | Central America | | | North America | | | South America | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | 2015 | 2016 | 2014 | 2015 | 2016 | 2014 | 2015 | 2016 | 2014 | 2015 | 2016 |
| 17,357 | 17,711 | 23,888 | 3 | . | 12 | 1,678 | 1,211 | 2,876 | 167 | 279 | 467 |
| 1,082 | 1,353 | 1,435 | . | . | . | . | . | . | . | . | . |
| 8,464 | 10,313 | 9,983 | . | . | . | 1,146 | . | . | . | . | . |
| . | . | . | . | . | 309 | . | . | . | 6 | . | . |
| 50,240 | 48,097 | 32,059 | . | . | . | . | . | . | 136 | 2 | . |
| 3,231 | 2,292 | 2,028 | . | . | . | . | . | . | . | . | . |
| 24 | . | . | . | . | . | 21 | . | . | 730 | 164 | 46 |
| . | 139 | 79 | . | . | . | . | . | . | . | . | . |
| 1,094 | 2,717 | 2,341 | . | . | . | . | . | . | . | . | . |
| 9,010 | 9,240 | 9,647 | 2 | . | . | . | . | . | . | 155 | . |
| . | . | . | 229 | 253 | 464 | . | . | . | 398 | 323 | 2002 |
| 6,987 | 4,177 | 2,176 | . | . | , | . | . | . | . | . | . |
| **97,489** | **96,038** | **83,636** | **234** | **253** | **785** | **2,845** | **1,211** | **2,876** | **1,438** | **924** | **2,515** |

| Europe | | | Central America | | | North America | | | South America | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | 2015 | 2016 | 2014 | 2015 | 2016 | 2014 | 2015 | 2016 | 2014 | 2015 | 2016 |
| 463 | 466 | 631 | 0.1 | . | 0.3 | 45 | 32 | 77 | 4 | 8 | 13 |
| 41 | 51 | 54 | . | . | . | . | . | . | . | . | . |
| 319 | 390 | 377 | . | . | . | 43 | . | . | . | . | , |
| . | . | . | . | . | 8 | . | . | . | 0.1 | . | . |
| 1,344 | 1,287 | 858 | . | . | . | . | . | 0.003 | 4 | 0.1 | . |
| 122 | 87 | 77 | . | . | . | . | . | . | . | . | . |
| 1 | . | . | . | . | . | 1 | . | . | 20 | 4 | 1 |
| . | 4 | 2 | . | . | . | . | . | . | . | . | . |
| 41 | 103 | 88 | . | . | . | . | . | . | . | . | . |
| 340 | 349 | 365 | 0.1 | . | . | . | . | . | . | 6 | . |
| . | . | . | 9 | 10 | 18 | . | . | . | 15 | 12 | 76 |
| 264 | 158 | 82 | . | . | . | . | . | . | . | . | . |
| **2,936** | **2,894** | **2,534** | **9** | **10** | **26** | **89** | **32** | **77** | **43** | **30** | **90** |

## Tab. 17: Germany: Total feedstocks of the biofuels[1]

| | [TJ] | | | [kt] | | |
|---|---|---|---|---|---|---|
| Feedstock | 2014 | 2015 | 2016 | 2014 | 2015 | 2016 |
| Waste/residual material | 21,698 | 22,183 | 34,183 | 579 | 586 | 906 |
| Barley | 1,082 | 1,353 | 1,435 | 41 | 51 | 54 |
| Maize | 9,610 | 10,313 | 9,983 | 363 | 390 | 377 |
| Palm oil | 17,922 | 11,908 | 16,744 | 424 | 291 | 422 |
| Rapeseed | 52,496 | 48,594 | 32,400 | 1,405 | 1,300 | 867 |
| Rye | 3,231 | 2,292 | 2,028 | 122 | 87 | 77 |
| Soya | 824 | 164 | 46 | 22 | 4 | 1 |
| Sunflowers | . | 139 | 79 | . | 4 | 2 |
| Triticale | 1,094 | 2,717 | 2,341 | 41 | 103 | 88 |
| Wheat | 9,012 | 9,395 | 9,647 | 341 | 355 | 365 |
| Sugar cane | 627 | 650 | 2466 | 24 | 25 | 93 |
| Sugar beets | 6,987 | 4,177 | 2,176 | 264 | 158 | 82 |
| **Total** | **124,582** | **113,884** | **113,528** | **3,624** | **3,353** | **3,334** |

Source: BLE
[1] Discrepancies in totals are due to rounding

## Tab. 18: Germany: Emissions and emission savings of biofuels[1]

| | Emissions [t $CO_{2eq}$/TJ] | | | Savings [%][2] | | |
|---|---|---|---|---|---|---|
| Biofuel type | 2014 | 2015 | 2016 | 2014 | 2015 | 2016 |
| Bioethanol | 38.06 | 24.53 | 20.58 | 54.58 | 70.73 | 75.44 |
| Biomethane | 20.66 | 13.17 | 8.03 | 75.34 | 84.28 | 90.42 |
| Biomethanol | . | 22.60 | . | . | 73.03 | . |
| FAME | 41.36 | 24.62 | 17.84 | 50.65 | 70.62 | 78.71 |
| HVO | 45.87 | 32.03 | 31.66 | 45.26 | 61.78 | 62.22 |
| Vegetable oil | 36.15 | 35.70 | 35.34 | 56.86 | 57.40 | 57.83 |
| UCO | . | . | . | . | . | . |
| **Weighted average of all biofuels** | **40.75** | **24.98** | **19.37** | **51.36** | **70.19** | **79.89** |

Source: BLE
[1] Discrepancies in totals are due to rounding
[2] Savings compared to fossil reference value for fuel 83.8 g $CO_{2eq}$/MJ

## Tab. 19: Germany: Emissions and emission savings of bioliquids[1]

| | Emissions [t $CO_{2eq}$/TJ] | | | Savings [%][2] | | |
|---|---|---|---|---|---|---|
| Bioliquid type | 2014 | 2015 | 2016 | 2014 | 2015 | 2016 |
| from cellulose industry | 1.87 | 1.58 | 1.73 | 97.94 | 98.26 | 98.10 |
| FAME | 35.44 | 46.47 | 45.25 | 61.06 | 48.93 | 50.27 |
| HVO | . | . | 44.50 | . | . | 51.10 |
| Vegetable oil | 37.19 | 36.90 | 34.26 | 59.13 | 59.45 | 62.35 |
| UCO | 19.31 | 14.00 | . | 78.78 | 84.62 | . |
| **Weighted average of all bioliquids** | **5.55** | **5.88** | **5.65** | **93.90** | **93.54** | **93.79** |

Source: BLE
[1] Discrepancies in totals are due to rounding
[2] Savings compared to fossil reference value for liquid fuel for electricity generation 91.0 g $CO_{2eq}$/MJ

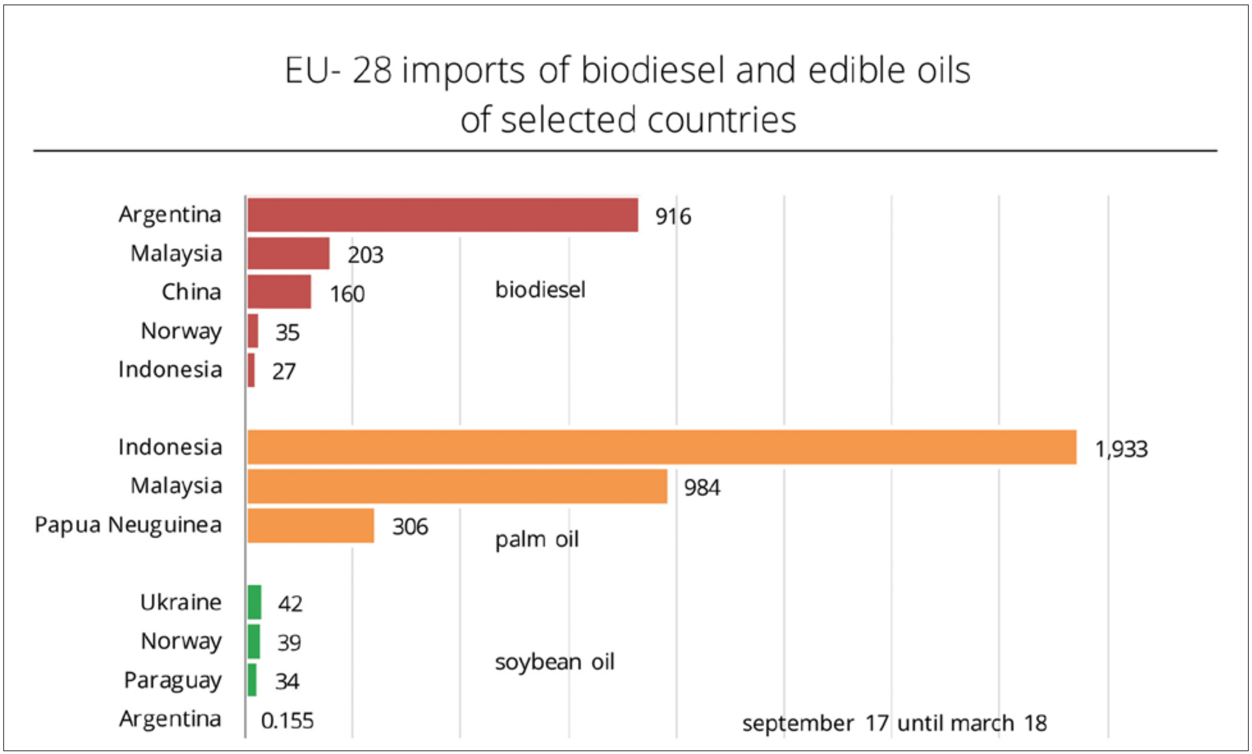
# UFOP Information Service – Chart of the week

## Selected information charts for 1st half of 2018

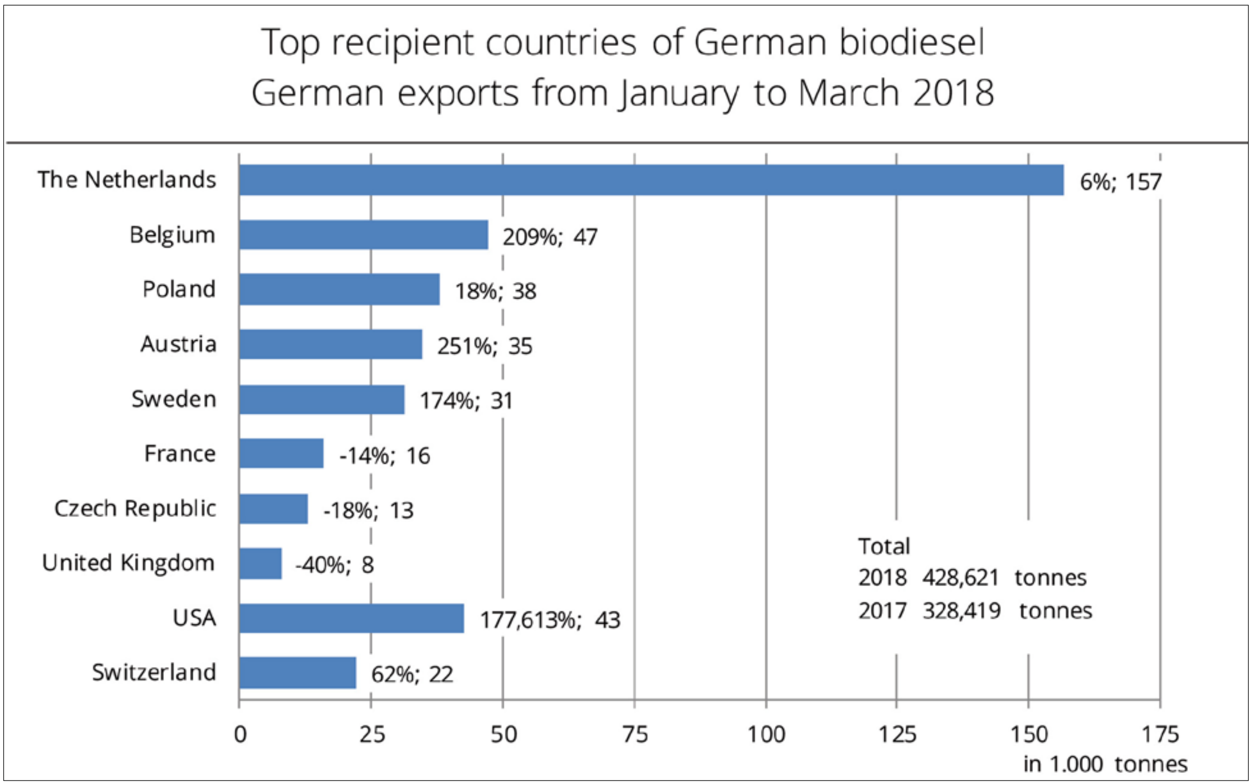
Further information on the charts and overall supply:

https://www.ufop.de/cotw-archive/

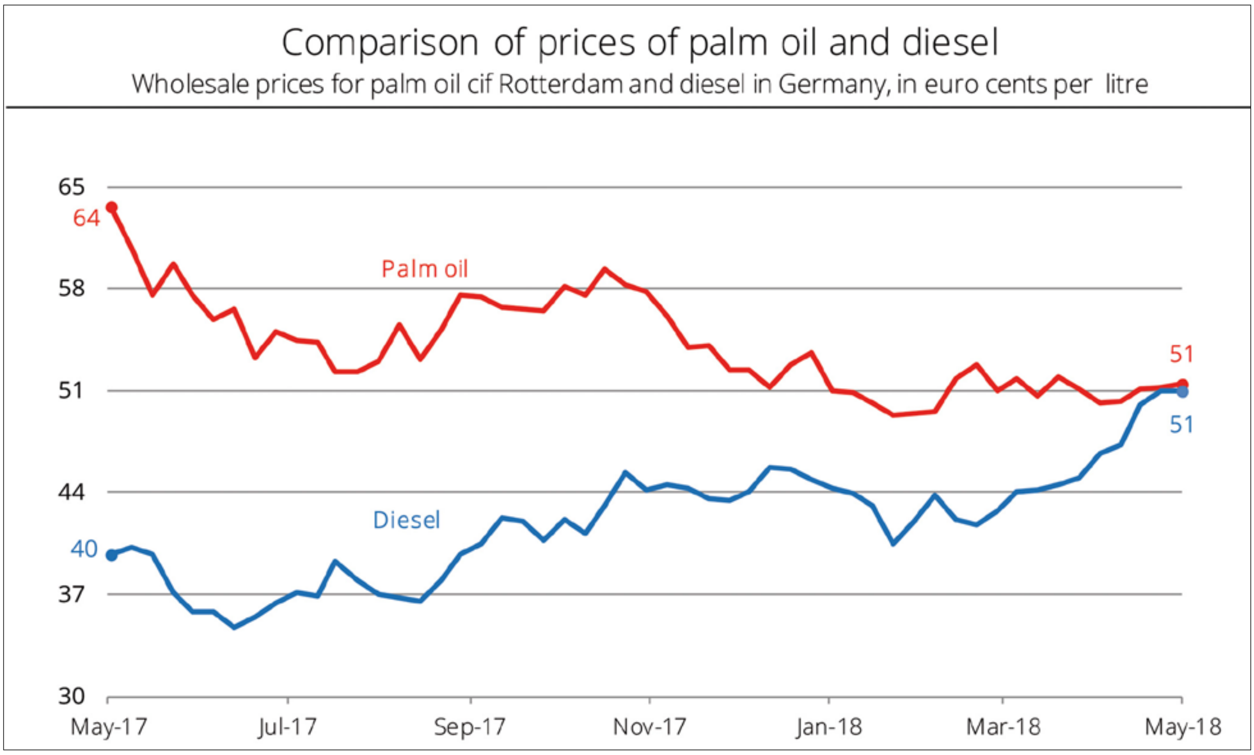
Tab. 20: Chart of the week CW 23



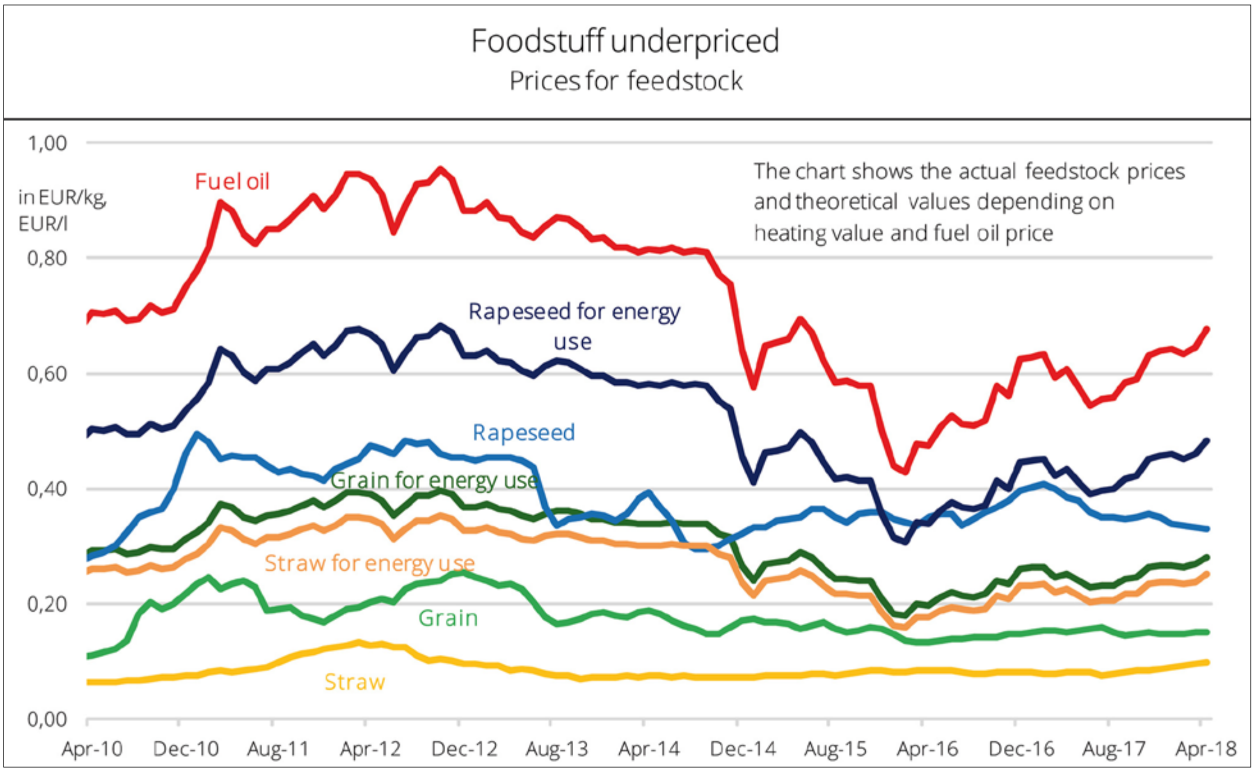

Tab. 21: Chart of the week CW 22



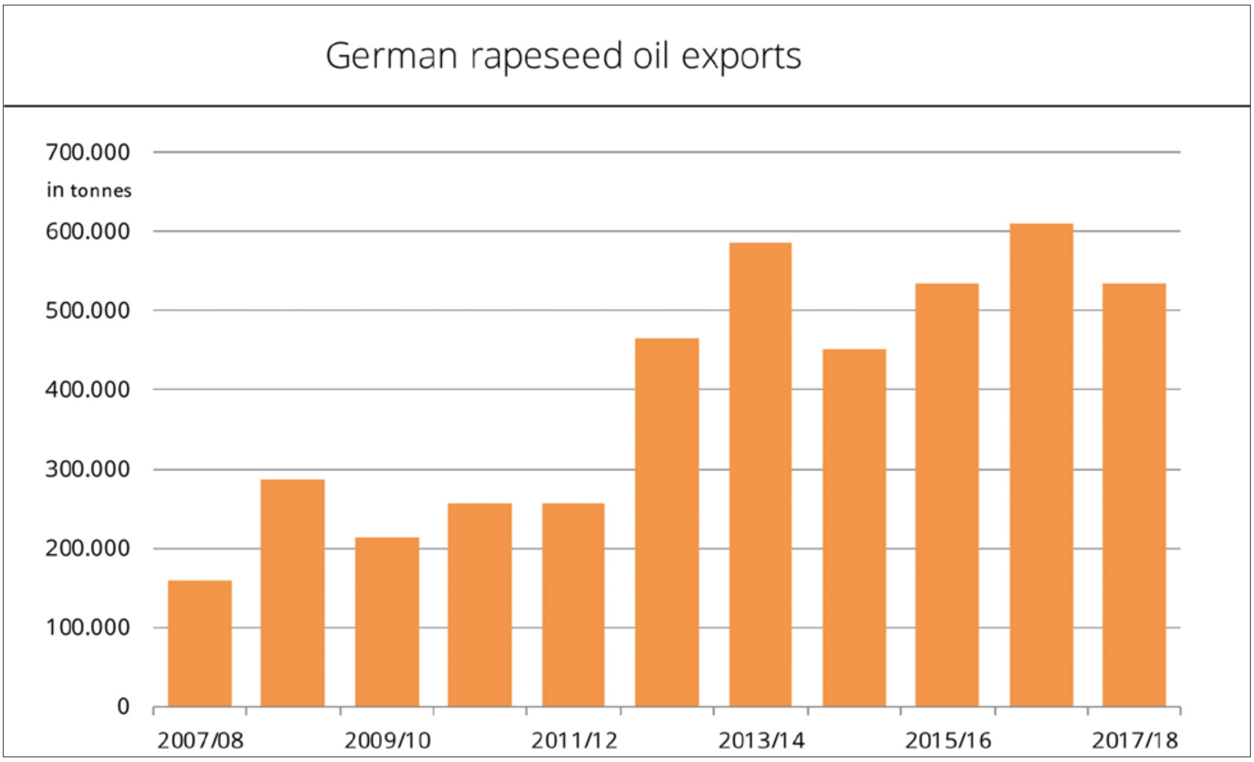
Tab. 22: Chart of the week CW 21



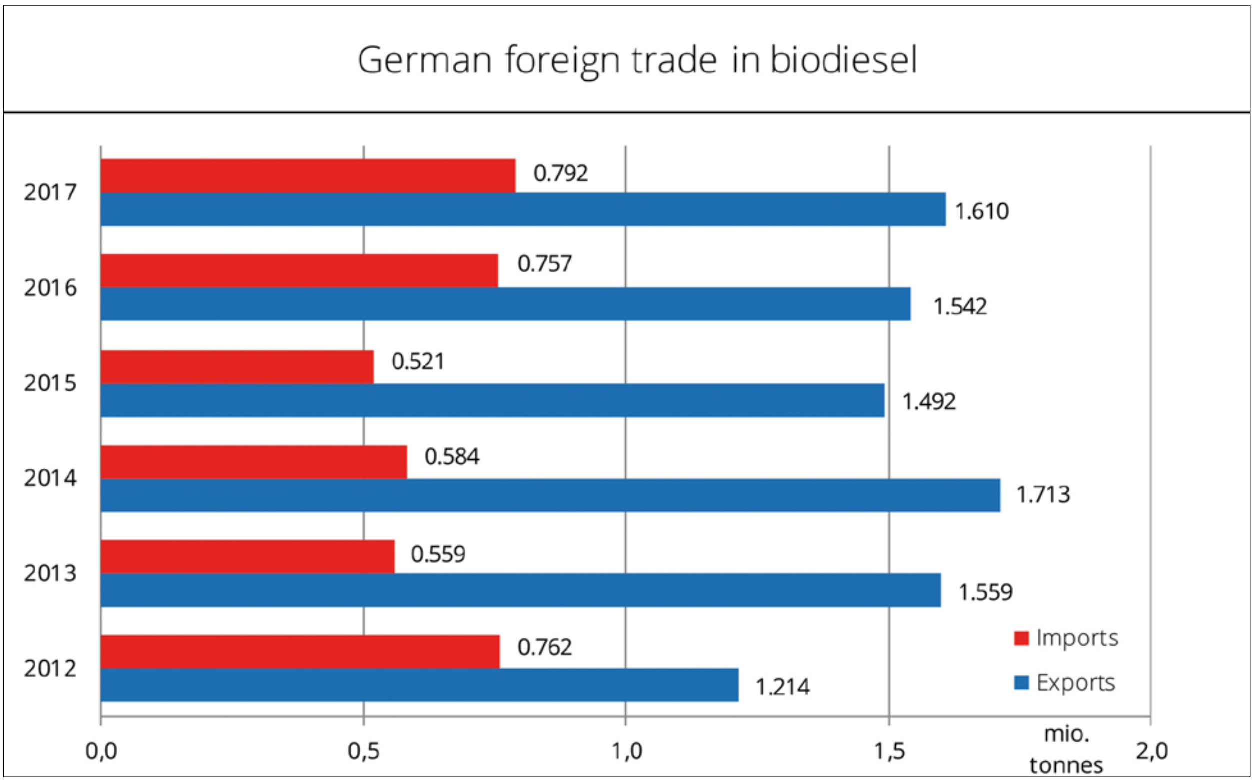

Tab. 23: Chart of the week CW 17



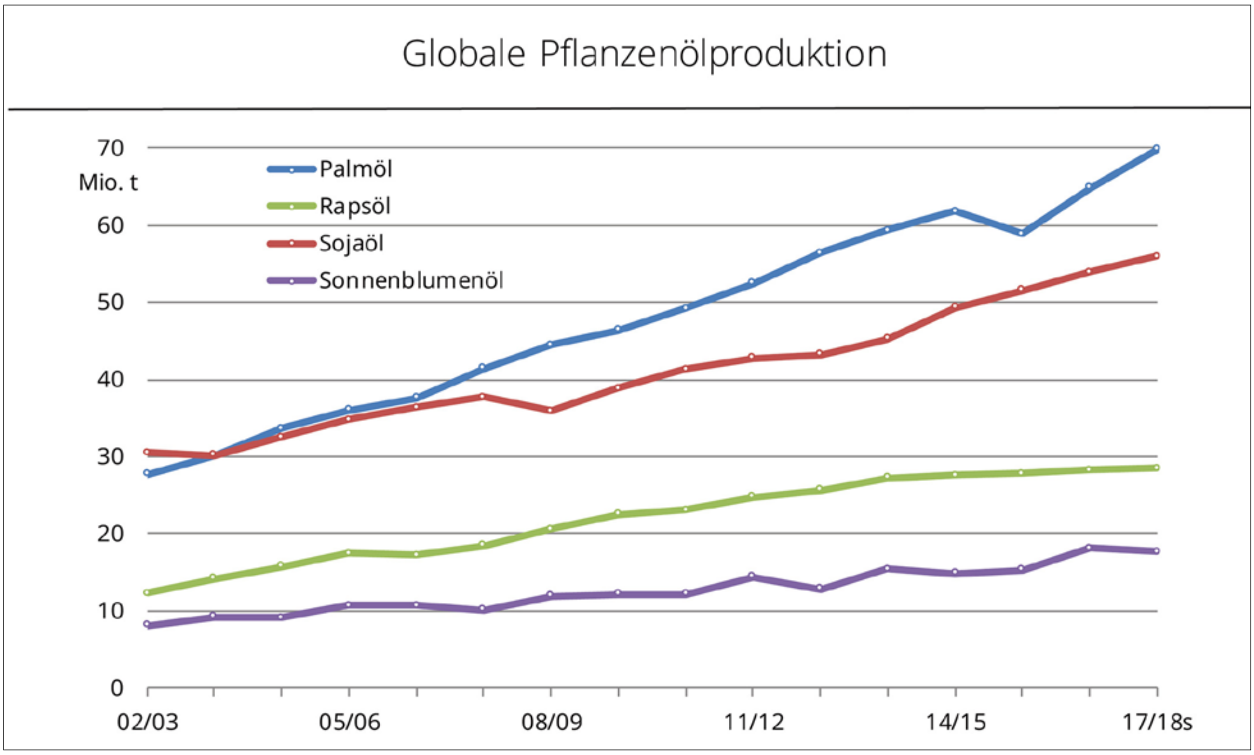
Tab. 24: Chart of the week CW 12



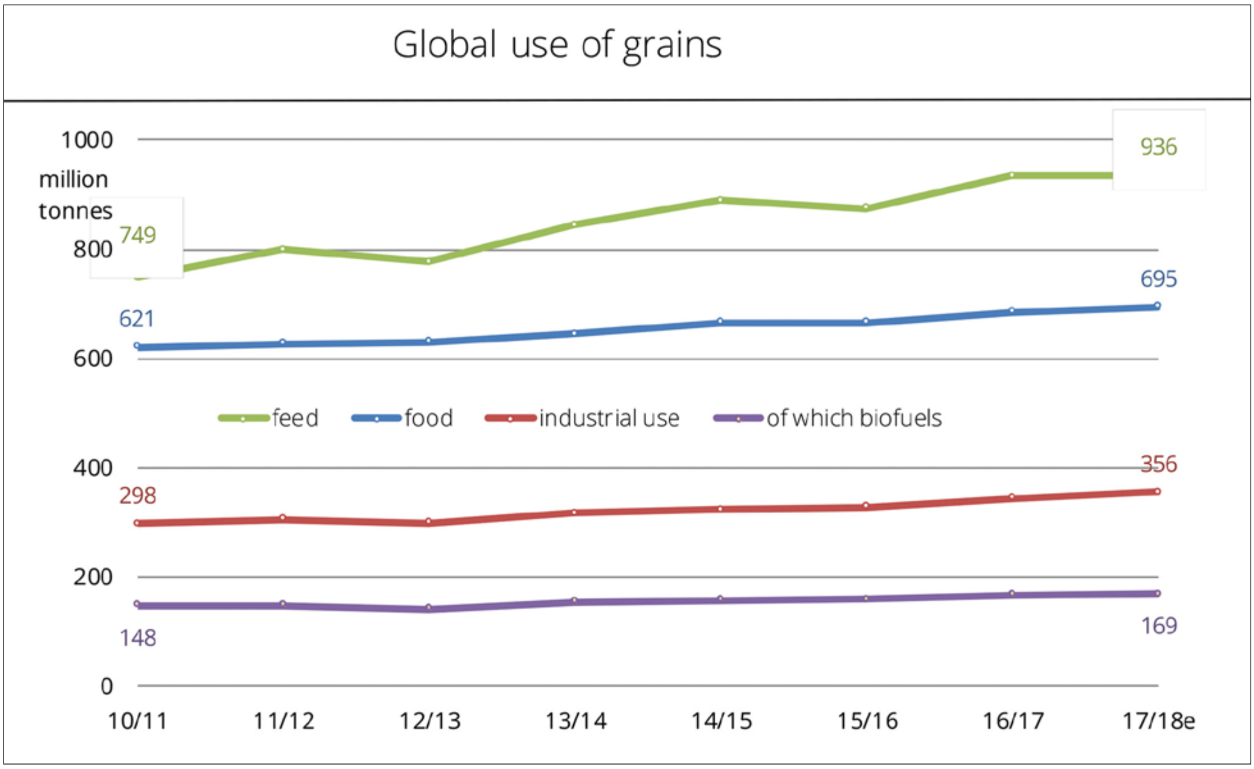

Tab. 25: Chart of the week CW 9



Tab. 26: Chart of the week CW 8




Tab. 27: Chart of the week CW 1



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